THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1446.] LONDON, JANUARY 27, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

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Parker's Imperial Black Varnish,
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TORBAY PAINTS
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23, GREAT GEORGE ST., WESTMINSTER, S.W.

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Capable of withstanding Greater Heat than that adequate to the Fusion of Iron.

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Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia, and Tar Products.

Apparatus already erected have proved more economical in consumption of Fuel, Simplicity, and Cheapness of Working than any known Plant.

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Testimonials & Estimates on Application.

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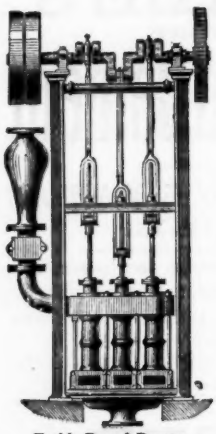
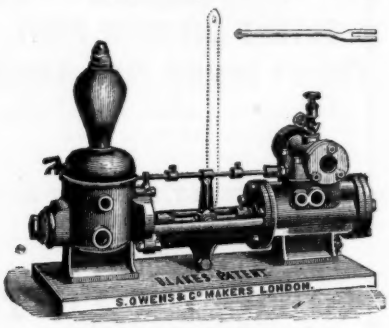
FOR PUMPING TAR, WATER, AND LIQUOR.



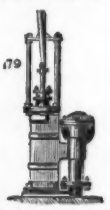
Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S
PATENT
STEAM PUMPS.
20,000 IN USE.



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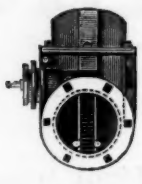

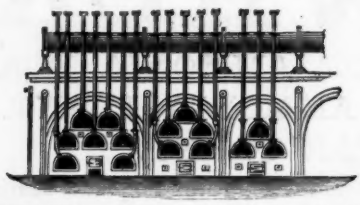

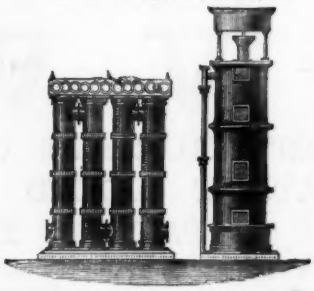

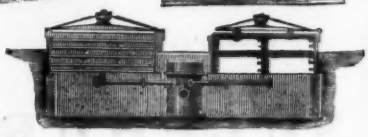

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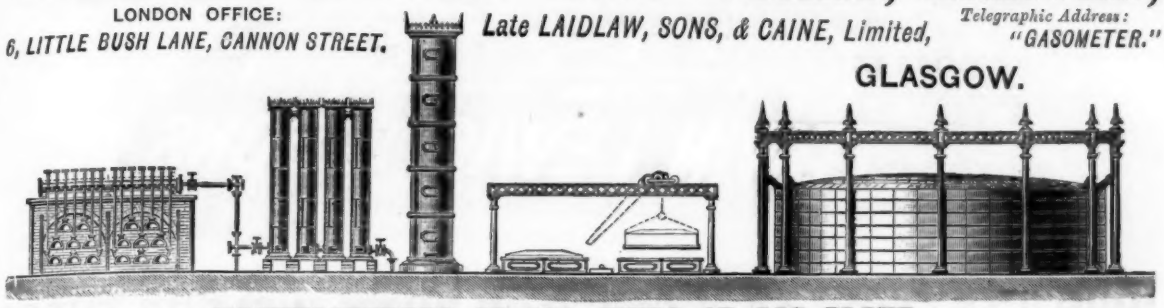

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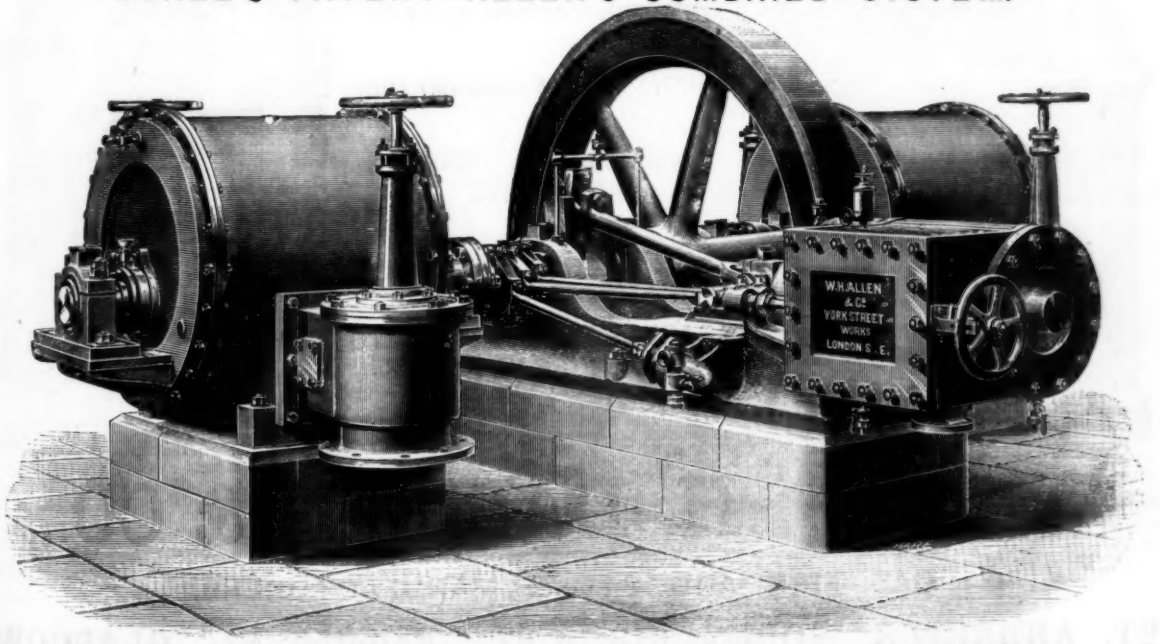

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FOR ANY PURPOSE.

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FOR
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SIEVES, TANKS,
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&c., &c.

RIVETS
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GASHOLDERS,
BOILERS,
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TANKS,
COVERS,
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SET SCREWS,
WASHERS,
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FISH PLATE BOLTS.

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SIZES—15in. WIDE, 6½in. DEEP, 20in. HIGH.
PRICE 25s. EACH, BEST BERLIN BLACKED.
ELECTRO-BRONZED or BRASSED, 8s. 6d. each extra.

A NEW DEPARTURE IN GAS-FIRES.

IMMENSE HEATING POWER.

DIMINISHED GAS CONSUMPTION.

SURPASSING ALL PREVIOUS ATTAINMENTS.

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NEAREST RESEMBLANCE TO A COAL FIRE YET MADE.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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GAS PLANT OF EVERY DESCRIPTION.

Wrought-Iron

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ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS.

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Flange Valve.

NO SLIP.

NO OSCILLATION.

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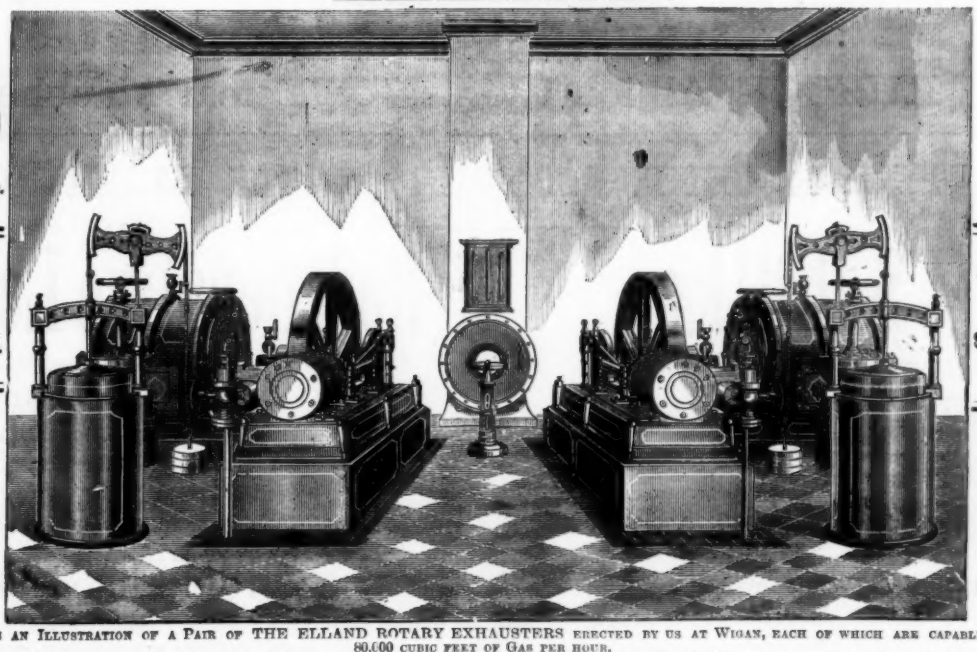

No. 5.
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NO HIGH SPEED.

STEADY GAUGE.

No. 6.
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Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

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MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO THE

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JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1½ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

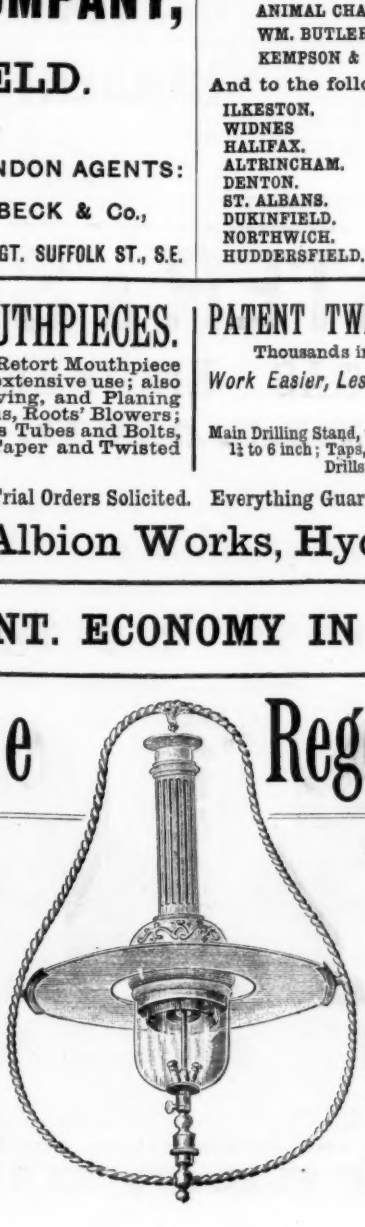
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.



Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.

LIMITED,

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Where Price Lists and full particulars may be obtained.

KIRKHAM, HULETT, & CHANDLER'S, LTD.

[SIDNEY HERSEY, Managing Director.] **NEW PATENT** [J. CHANDLER, Engineer.]

"STANDARD" WASHER.

EXTRACTS THE WHOLE OF THE AMMONIA

Also a Large Proportion of H_2S and CO_2 from Gas.

The following List comprises the orders received for PATENT "STANDARD" WASHERS constructed according to the Company's latest patent, and Renewals effected by the application of same to old pattern Machines.

NEW PATENT "STANDARD" WASHERS.

THE GASLIGHT AND COKE COMPANY—	Capacity, cub. ft. per 24 hours.
Kensal Green	3,000,000
,,	3,000,000
West Ham	3,000,000
Liverpool	3,000,000
Rochdale	3,000,000
Manchester	2,500,000
Glasgow	2,500,000
,,	2,500,000
Leicester	2,250,000
Melbourne	1,500,000
Charlottenburg	1,500,000
Derby	1,500,000
,,	1,000,000
Cambridge	1,000,000
Nice	875,000
Barcelona	875,000
Magdeburg	750,000
Valparaiso	600,000
Halle	600,000
Barry and Cadoxton	500,000
Workington	500,000
Lowestoft	500,000
Erfurt	400,000
St. Chamond	350,000
Atlas Steel Works, Sheffield	250,000
Lille	250,000
Rawmarsh	200,000
Vercelli	200,000
Hitchin	150,000

RENEWALS.

THE GASLIGHT AND COKE COMPANY—	Capacity, cub. ft. per 24 hours.
Beckton	2,500,000
,,	1,250,000
Nine Elms (in part)	3,000,000
Shoreditch ,,	2,500,000
Pimlico ,,	2,000,000
Bromley ,,	2,000,000
SOUTH METROPOLITAN GAS COMPANY—	
Vauxhall (in part)	3,000,000
Birmingham ,,	5,000,000
Croydon	1,500 000
Edinburgh	1,500,000
West Ham	1,500,000
Nottingham	1,500,000
Melbourne	1,500,000
,,	1,500,000
Maidstone	1,000,000
Kingston-on-Hull	400,000
Harrow	250,000
Buxton	250,000

For Testimonial from the Chief Engineer of The Gaslight and Coke Company, see last and next week's issue of the "Journal."

Palace Chambers, Bridge Street, Westminster, S.W.

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER,

MAKERS AND ERECTORS OF

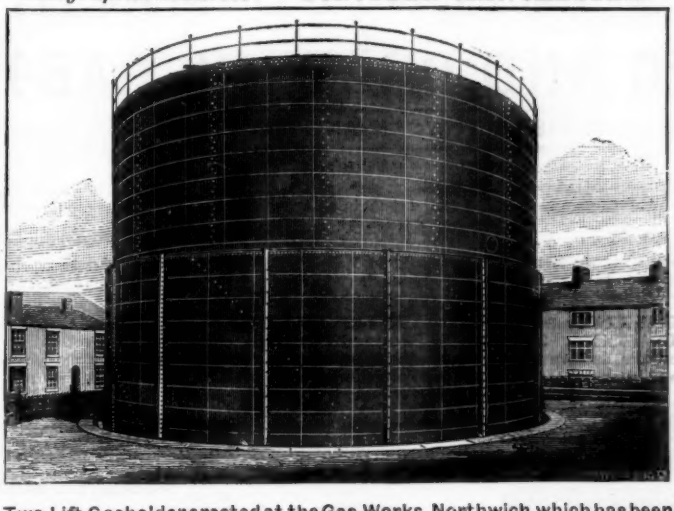
PATENT COLUMNLESS GASHOLDERS.

Telegraphic Address: "SCRUBBER MANCHESTER."

TOTAL WEIGHT REDUCED
from 30 per cent. to 50 per cent.

TRANSPORT AND ERECTION REDUCED
to the same extent; and in cases where gasholders are shipped abroad to places difficult of access, this represents a very large amount of money.

TANK CONSTRUCTION SIMPLIFIED.
The Tank wall (of whatever construction) is a regular cylinder. There are no piers needed, and all expensive foundation stones for the base of columns or standards are dispensed with.



Two-Lift Gasholder erected at the Gas-Works, Northwich, which has been in continuous work since Jan. 3, 1890, and has been subjected to most severe tests from heavy gales, with perfectly satisfactory results.

COST OF PAINTING SAVED
for the Columns and Girders.

TILTING UTTERLY IMPOSSIBLE;
And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

STABILITY UNDER WIND PRESSURE
of a Gasholder constructed upon this system is at least equal to, and from experiments and calculations made is far in excess of, that of a Holder of the same dimensions guided by the elaborate guide framing at present in use.

The removal of heavy guide carriages and rollers from the top curbs considerably lowers the centre of gravity of the structure, and dispenses with the extra strength of sheeting necessary to carry these at the points where they are attached to the gasholder.

The plan adapts itself to telescoping to any reasonable extent, and enables very shallow holders or lifts to be employed with perfect stability.

FOR FURTHER PARTICULARS AND ESTIMATES, APPLY TO THE ABOVE.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

Abercorn Foundry and Abbey Works,

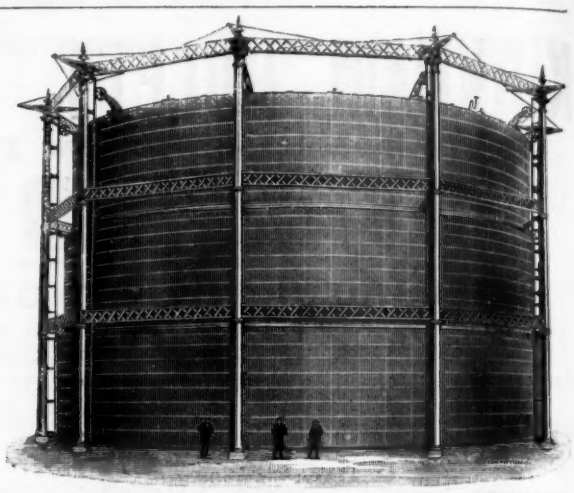
PAISLEY, N.B.,

MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.

Telegraphic Address: "Donald Paisley."



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ESTABLISHED TWELVE YEARS. Hundreds of thousands in use.

UNEQUALLED FOR BRIGHTNESS, SOFTNESS, & ECONOMY.

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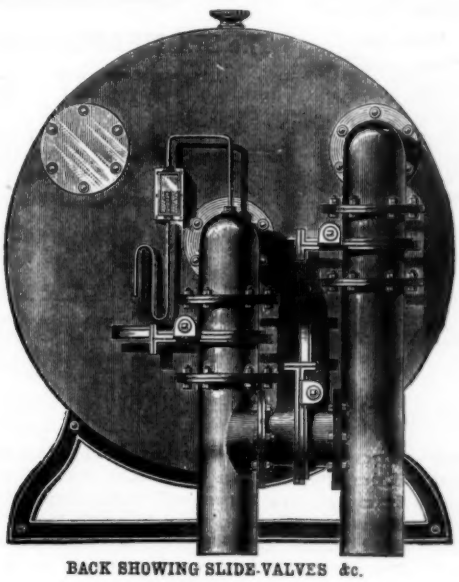

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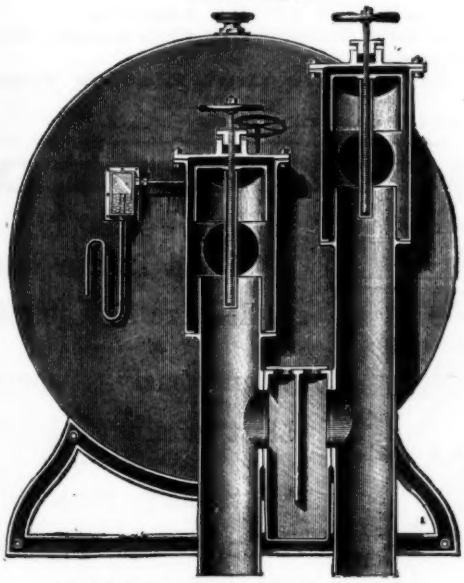

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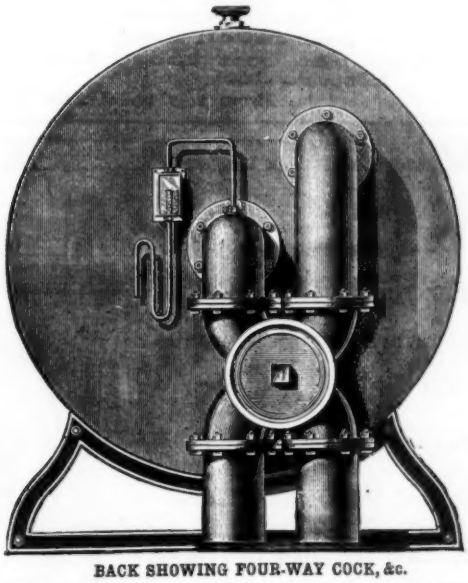

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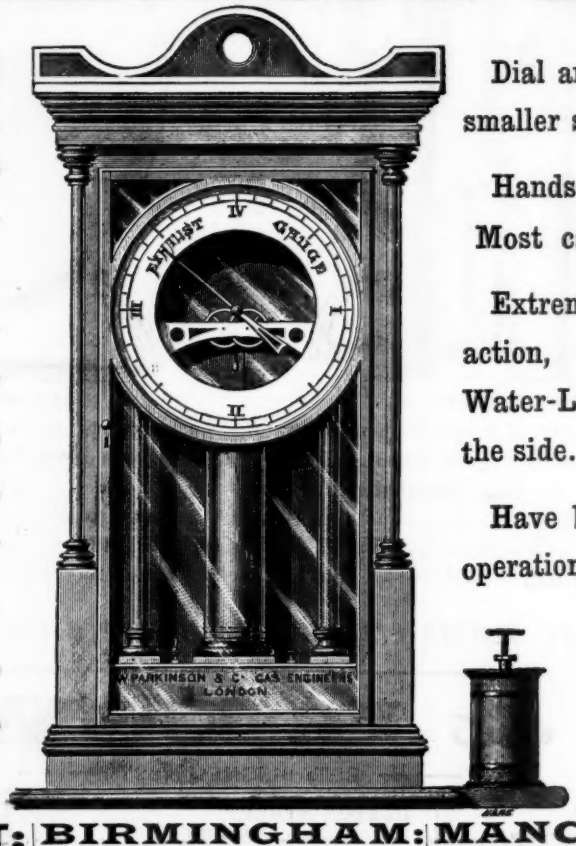

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 27, 1891.

Some Gas Bills of the Present Session.

THE parliamentary history of the present session, in so far as it is concerned with Private Gas Bills, will repeat in its most salient features the chronicle of last year. Again the future of the Partick, Hillhead, and Maryhill Gas Company will engage the attention of Select Committees, and again the expansive desires of the Glasgow Corporation will be criticized with all the show of righteous indignation against the tyranny of big corporations that eminent Counsel instructed by the other side know so well how to work up. Circumstances have much changed for both the Glasgow Corporation and the Partick Company since this time last year. Both parties have been chastened by failure in Parliament, and have accordingly come again with more moderate desires. A year ago the Corporation drafted their Bill as though there were no independent Gas Company in the extra-municipal districts they proposed to include within their extended boundary; and when the existence of the Partick Company was forced upon their perceptions, they affected to consider this undertaking as destitute of any rights which they, as a public authority, were bound to respect. This position was a little too arrogant for Parliament; and accordingly the Corporation lost their Bill. On the other hand, the Partick Gas Company asked for full statutory rights and privileges in face of the opposition of the Glasgow Corporation, and wanted to be treated in all respects as though they had in fact been a statutory Company all along, instead of the adventurers they really were. We do not use the latter term in any invidious sense, but merely as expressing better than any other word the really speculative character of the Partick Company's business, which was got together bit by bit under the noses of the Glasgow Gas Commissioners, whose methods were less pliant than those of the Company. The Corporation, having allowed the Company to grow into a big concern, thought they could wipe it out at pleasure by assuming the powers of a local authority over the districts through which their own and the Company's mains ran indiscriminately. Parliament undeceived the Glasgow people upon this head, however, and gave them to understand that, "squatters" though they were, the Partick Company had succeeded in creating, by virtue of services rendered to the public, a species of *de facto* right in their district. To the Partick Company, again, Parliament said that, in face of the undoubted statutory privileges of the Glasgow Corporation in the same district, this *de facto* right could not be converted into a right *de jure*.

In dismissing both petitioners last year, Parliament practically sent them home to think the matter over in the fresh light that the proceedings in Committee had shed upon them. This has evidently been done; and both parties are back again with modified projects. The Glasgow Corporation still wish to enlarge their boundaries by including the local board districts of Partick and the rest, where the complaisance of the lighting authorities has constituted the only charter of the non-statutory Gas Company. But they offer to bind themselves not to interfere in any way with the use of the roads by "any "company or person at present supplying gas" in the new municipal area. This self-denying offer could not be expected to satisfy the Partick Company, who are promoting a fresh Bill for incorporation with statutory powers, offering to take an initial price of 2s. 6d. per 1000 cubic feet for 20-candle gas, tested on the works—which is a reduction of 6d. per 1000 cubic feet on their demand of last year—and making sundry proposals (the nature of which is explained in our abstract of the Gas Bills of the year published last week) for settling themselves amicably as next-door neighbours of the Glasgow Corporation in the same line of business. It is necessarily quite impossible to predict the course that Parliament will take with regard to these two Bills. The only thing that may be assumed with tolerable certainty is that they will not become law in their existing shape; but whether they will pass in any form, or be sent back for another year to see if the parties will come to a better agreement, nobody can say. This Glasgow business ought to be the fight of the session, if the same able advisers are again engaged on both sides.

Another contest that will be resumed on the same ground as last year, although upon different lines, has reference to the gas supply of Whitehaven. Last session the Gas Company promoted a Bill, which exhibited several remarkable features, for incorporation with statutory privileges; and they were successfully opposed by the Local Authority. This time the return match is to come off; the Local Authority being desirous of compulsorily acquiring the undertaking of the Company. There is a great difference in the views of the parties respecting the necessary conditions of a prosperous gas undertaking for the district. The Company last year asked for an initial price of 5s. per 1000 cubic feet for 14-candle gas;

but now the Local Authority are willing to take a maximum price of 3s. per 1000 cubic feet for 16-candle gas. Like the Company last year, however, the Local Authority have a mind to dabble in electric lighting. This Whitehaven business comes closely after the Glasgow matter for interest; and, curiously enough, in both cases the Gas Company concerned is without statutory powers. The other Gas Bills of the session which contain remarkable provisions have already been commented upon.

One Bill of which notice was given—that promoted by the Bowman's Oxygen Company for distributing this gas by means of pipes throughout the Metropolis, and for sanctioning agreements between the Company and the lighting Gas Companies for combined supplies, and for other purposes—may be briefly alluded to here, although it will not be proceeded with. It was not to be supposed for an instant that the Bill would have a chance of passing; and therefore its promoters have judiciously allowed it to drop. A very strong case would have had to be made out for any additional main-laying project applying to the Metropolitan area; and this could not be done at present for oxygen. Moreover, if the Bowman oxygen was supposed to be delivered with coal gas for the purpose of improving the illuminating power of the latter, the Brin Company would have had something to say upon this head. The whole project was simply unintelligible, save as an advertisement of the promoters. Oxygen still awaits its market as a necessary of life. The idea of delivering it throughout London by pipes is nearly as fantastic as would be that of delivering patent medicines in the same way. Oxygen is useful for many purposes in proper hands; but there are reasons why a Parliamentary Committee should hesitate before sanctioning its wholesale introduction into private houses.

Scotch Private Bill Procedure.

PARLIAMENT has met; and the first day's business in the House of Commons was a mistake. The proposal of the Government to create a Scotch Commission to deal in Scotland with Private Bills relating to North British affairs was referred to a Committee; but it may be hoped that it will be allowed to drop quietly out of the Orders. What the Government hope to gain by proposing such a scheme must for ever remain a mystery. The Scotch members are not pleased with it; and nobody else likes it. The idea is that Scotch Private Bill business shall be referred to a Commission composed of a Judge of the Court of Session, a Railway Commissioner, a selected member of the House of Commons, and another gentleman nominated by the Court of Session. It may be admitted that ordinary Private Bill Committees of the House of Commons are bad enough sometimes; but there is no real guarantee that the proposed Commission will work better. The House of Lords, moreover, are ignored in the scheme; and it is notorious that the average Lords Committee is superior to the average Commons Committee. Besides, why a special tribunal should be necessary to consider the half-dozen or so Scotch Bills a year that come to Westminster, remains unexplained. The English Parliamentary Bar can deal with them easily enough under the present system; but how will the work be done when this class of business is transferred to Edinburgh? It is clear that no expense will be saved by the Government project; but rather the contrary. There are great grievances connected with the present system, it must be confessed; but these affect other interests besides those of Scotch promoters and opponents. If arrangements could be made, for example, whereby specified business could be taken at certain dates, it would save a vast deal of wasted outlay upon both witnesses and counsel. A great expense is consequent upon the uncertainties of the lists, through which country witnesses are kept in London over an unnecessary period, and Counsel are enabled to pile up exorbitant bills for nothing at all. But it may be seriously doubted whether removing private business from Westminster would save money or give satisfaction to anybody. There should still be one centre for parliamentary business; but there is no valid reason why some of the money at present wasted on it should not be saved by a more intelligent management of the "paper." This remark only applies to ordinary business. For important matters, whether English, Irish, or Scotch, the outlay will be correspondingly important, whatever the constitution of the tribunal, or wherever its work is performed.

The Gas Affairs of Manchester.

ALTHOUGH, as stated in last week's JOURNAL, the new proposition of the section of the Manchester City Council represented by Alderman Sir J. Harwood, to take a considerable subsidy from the profits of the city gas undertaking to help pay for the Thirlmere Water-Works, does not directly affect the price of gas, there are indications that the suggestion is awakening the local public to a better sense of the mistaken policy of the Corporation in treating the Gas Department as the city milch cow. All that Alderman Harwood proposes to do is to take £30,000 from the gas profits of the first year, instead of writing an equal amount off the total cost of the works; reducing the subsidy by regular decrements of £2000 yearly until it disappears. The public, however, are beginning to see, by the light of this suggestion, that if the Gas Department can give away money to this tune, it must be because the price of gas is unnecessarily high. There is hope for Manchester yet, if such an idea can be planted and made to work in the minds of ratepayers. The whole scheme of Manchester gas administration has been contemptible for many years. Rather than employ a really able man in the capacity of Chief Engineer, who, if he was worth his salt, would have been beyond the individual control of the busybodies and nobodies of the Council, this august body has wasted the resources of the gas undertaking to the amount of thousands of pounds annually. If the Corporation would only appoint a good man, with a salary of (say) £1000 a year to begin with, and a promise of double the amount in five years, before that time Manchester gas would be among the cheapest and best in the kingdom. In order to effect this end, however, all the dead load of subsidies to spending Committees, &c., would have to be thrown over. The whole system of Manchester gas administration needs overhauling. There will be no more million-ton coal contracts as it is; but other abuses and shortcomings also require to be dealt with by a stronger hand than has touched the Manchester Gas-Works for many a long day. It may be admitted that the right man for Manchester may not be easy to find. Perhaps the very best men may be unattainable; but Manchester ought not to be served by any but one of the best. A second-rate man would be worse than useless. There is a great opportunity in Manchester for showing how coal gas ought to be made and used for the benefit of the people; but the Corporation have got into such a rut that it will take something like an insurrection of the ratepayers to lift them out.

The Glasgow Catastrophe.

NOTHING more has transpired respecting the Glasgow gasholder disaster that can be qualified as throwing any light upon the cause of this extraordinary occurrence. More experts have been called in by the Gas Committee to look at the wreck; and although it is somewhat oracularly reported that these gentlemen have completed their examination, nothing like a definite expression of opinion has been published. Hints have been dropped, however, that the destruction may be found to have been caused by dynamite; but the manner in which this rumour is spread makes it look as if it was the comment of the ingenious newspaper reporter, to whom such a suggestion would very naturally occur. It is announced that the affair will be made the subject of a public inquiry, which is, indeed, the only proper course for the local authorities to take. Unless this is done, there will be plenty of people to say that some occult reason existed for keeping the whole affair dark. If the cause of the accident had been so perfectly obvious that any two competent engineering authorities could have agreed upon the substance of a report on the matter within a few hours, no formal inquiry would have been necessary. As it is, however, the mystery has been allowed to thicken; and it must be dispelled in the only effectual manner, not only for present satisfaction, but also to stop any future insinuations of want of candour on the part of the Committee.

A Suicide by Coal Gas.

THE report, published in last week's newspapers, that the Turkish Ambassador at the Court of Vienna had committed suicide by poisoning himself with coal gas in his apartment, arouses many curious reflections in the mind of a gas engineer. We are not aware of any previous instance of the kind having occurred during all the years that coal gas has been generally distributed over Europe

as an illuminating agent, although we would not go so far as to claim this case as absolutely unprecedented. The ways of persons afflicted with suicidal mania are very various; and it would be rash to suppose that Sadullah Pasha was original in the manner of his self-destruction. Of one thing, unfortunately, there in only too certain probability —that the flavour of sensationalism in his deed may attract other miserable folk to follow his sad example. Crimes are apt to succeed one another in batches; there being a gruesome sort of "fashion" in this as in other human tastes. It is to be hoped, however, if only for the sake of other people, that there will not be a great run upon coal gas by those who are desirous of trying a novel experiment in self-murder; because the quantity of gas that would be required to asphyxiate an individual in a single room would be sufficient to blow up a whole house if it should come into contact with a light when in the ordinary course the room-door was broken open. It is reported that Sadullah Pasha had taken considerable trouble to compass his end; having provided himself with a connecting-pipe of special construction for conveying the gas from the lighting-bracket to his bed, where he must have covered himself with the bedding, and so made a kind of asphyxiation chamber. Experience shows only too clearly that when once a man becomes possessed with suicidal desires, he seldom lacks means or art in accomplishing his purpose. Coal gas is, however, a troublesome and inefficient toxic agent compared with water gas as sold in America, containing about 40 per cent. of carbon monoxide, and carburetted with light hydrocarbon which hardly renders it unpleasant to breathe. That this compound is answerable for the death of many people, nobody cares to deny; but there is a good deal of controversy respecting the manner of the deaths. It is difficult for some critics of the reports of these fatalities that get into the American newspapers to accept the usual convenient theory that the sufferers have in all cases contributed to their own deaths by "blowing out the gas." A British Coroner's jury sometimes takes hold of funny notions; but it may be doubted whether any such collection of thirteen townspeople—including the Coroner—who could be brought together in the length and breadth of the kingdom would endorse the suggestion that a victim of gas poisoning had practised this method of putting out his bedroom light before retiring. Many American inquirers into this matter hold that the great majority of cases of gas poisoning in that country are either murders or suicides, and that the truth is concealed by those who have some interest in so doing. Defective fittings, also, are responsible for some of these "accidents;" the prevailing American craze for cheapness betraying itself in bedroom gas-brackets as in other things not bought for ornament. If anybody is bent upon following the wretched example of the Turkish Ambassador to Austria, it does not, of course, really matter much whether coal or water gas is made available for the purpose; but we may state, without fear of contradiction, that the former, as usually supplied, is a most objectionable product to inhale, and that a would-be suicide must take a great deal of trouble, and be prepared to persevere through much unpleasantness, if he selects this means of making his *quietus* in preference to the usual methods.

Students as Meter Inspectors.—Referring to this subject, which was mentioned in a paragraph in the last number of the JOURNAL, *Light, Heat, and Power* says that when the plan of employing students as meter inspectors was tried at Chicago, some trouble was experienced owing to inaccuracy; but such a fault is not likely to be found at Boston, our contemporary considers. "From Ibsen and Hegel," he says, "the transition to their new duties will be an easy one for the students; and the objects accomplished are greater in number and, in the long run, far more important than the mere saving in wages. The employment of young men directly from the body of the people, cannot fail to have effect in putting down much of the senseless antagonism the public holds toward the innocent register of gas consumed; while it will demonstrate that anyone who will can read a meter's story, and keep the tally of his own gas consumption. Besides, this system is training the coming generation into a knowledge that the gas-meter is an honest measure; and this leaven must spread its good qualities through bushels of otherwise stupid meal. And, again, the inquiring minds of some students may go beyond the semi-recreation of statement-taking; and every honest student led toward investigation of the more serious matters connected with the gas industry, is so much gain. By all means, keep the young men at this work; and let the direct and immediate advantages of the plan be known, so that other companies may be induced to try the system."

WATER AND SANITARY AFFAIRS.

THE London County Council could scarcely be more busy with the water question if they had a Bill of their own to promote on the subject. There is no doubt they have in view a certain Bill, not ostensibly their own, which is capable of being put into shape so as to give them all they desire. In the recent report of the Parliamentary Committee, this measure is referred to, in a distant kind of way, as "a Public Bill," of which notice has been given. This notable Bill, initiated by the Vestries, and supported by Vestry funds, will shortly make its appearance; and the County Council will, in due course, take up an attitude of opposition towards it, with a perfect readiness to face-about as soon as occasion serves. Assuming that the various Bills bearing on the water supply of London come to be read a second time, it is expected that they will all be referred to the same Committee of Parliament. But there is an idea that the scope of the reference may be so enlarged as to admit a consideration of the water subject generally, or some particular branches of it. The Parliamentary Committee of the County Council, in discussing the London Water Commission Bill of the Corporation, say "the case to be presented on behalf "of the Council will be difficult, and will require "exhaustive and early consideration." Viewing the question in its broadest aspect, as including all the Bills, the Committee advise the Council that it will be necessary to go before Parliament "with a clearly-defined policy," and with witnesses who shall have grasped all the details of the subject, so as to be able efficiently to "defend that "policy." The Council are reminded that this will be "a very heavy task; and if it is to be performed in any "degree satisfactorily, the preparation should be taken in "hand without the delay of a single day." The Council, at their last meeting, agreed to all the recommendations of the Committee; and hence we may conclude that the process of getting ready is now being vigorously entered upon. The kind of task so undertaken is indicated by the outline given in the Committee's report, where we read: "The elaboration of necessary statistics, the selection of "facts to be laid before the Parliamentary Committee, "and the general arrangement of the case, will involve "long and careful preparation." For this reason the Committee think it desirable that some general instructions should be given at the earliest possible date, "which "should authorize the officers of the Council to take "this matter in hand with considerable discretion as "to the assistance in various ways which they may "find necessary." In order to expedite matters, it was proposed by the Committee, and has been agreed to by the Council, that a Sub-Committee be appointed for the purposes thus sketched out; the members to be three from the Parliamentary Committee, two from the Finance Committee, and two from the Special Water Committee. The members thus selected are to be under the wing of the Parliamentary Committee, which seems a little odd, considering the special nature of the subject. On the whole, we must say there is a wonderful amount of zig-zag work in the County Council with regard to the London Water Question. What the Council want is really to buy out the Water Companies and take their place. What they are professedly seeking is a general overhauling of the entire question; and they have the report of their Engineer (Mr. A. R. Binnie), recommending them to see what water there is to be had somewhere in Wales, or Devonshire, or anywhere away from the Thames and the Lea. No doubt there is water to be had a long way off, and possibly it may be brought in on a level with the Golden Gallery of St. Paul's. But the ground is occupied, the Companies are in possession, and, even if their monopoly is disputed, there is no getting over the fact that their pipes are laid in every street, with connections to almost every house. Siege is being laid with lines at a long distance; but the citadel remains to be attacked, and the fight must come to close quarters before it is over. The Companies act on the defensive, and must be supposed to rate at their true value certain feints on the part of their assailants. False issues have been raised, and more are coming. The real contest is for a revenue coupled with patronage; but this is the last thing that is talked about. All that the public hear is something about quantity, quality, rateable value, and the supreme excellence of a responsible public authority.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 168.)

THE Bank of England rate was lowered on Thursday to 3½ per cent.—the 4 per cent. rate having lasted a fortnight; and the abundance of money is such that a further reduction of the rate at no distant date is quite on the cards. In these circumstances, it is natural that investment business in the Stock Exchange should have received something of a fillip, and choice securities have consequently been in better demand. Speculative business, however, has looked the other way, and the tendency is more in the direction of the "bears." Many things unite to work in their favour, among which the following are prominently conspicuous: South American troubles, which are now no longer confined to Uruguay and Argentina, but involve nearly the entire continent; the great silver question, which agitates the United States; and the reduction wrought by the exorbitant prices of coal and labour in the profits of trading and industrial undertakings. In this respect the accounts issued by some of the railway companies have caused considerable agitation; but there are others yet to come which will be more interesting to gas proprietors. The Gas Market continues fully active; but prices have undergone some little reduction. In view of the smart upward rise recently effected by the chief issues, some realization of profits might be looked for as a matter of course. The fall, however, has not been heavy. Gaslight "A" opened a point easier on Monday, and gradually fell away another. A special bargain at 246½ on Saturday was the lowest of the week. The debenture and preference issues, however, have been wanted for the investment of cheap money; and some of the former have gone up in price. The £300,000 "K" stock offered by the Company at not less than 140 was all taken up at prices ranging from 140½ to about 144¾; the lower rates preponderating. In the Market, 151 (equivalent to 148 *ex div.*) was given for "K," although for 145 the buyer could have had all he wanted direct from the Company, and free of stamps and commission. The Directors recommend a dividend at the rate of 13 per cent. for the last half year. If they have earned anything at all approaching that figure, well and good. But for the two previous half years, they distributed in dividends about £280,000 more than they had earned; and we should be disposed to anticipate that to provide the proposed dividend will necessitate a still larger rate of overdraft. Is this wise? But we will await the issue of the accounts before saying more. Of South Metropolitans, the "A" is firmest and most active. Commercials are quite stagnant. Suburbans and Provincials continue almost unnoticed, and quite unchanged. Among Foreigners, a good deal of business is being done in Imperial Continental. The price is slightly easier; but it does not look like going lower. The rest present no particular feature; and the same may be said of the Water Companies in general. All the old quotations hold good.

The daily operations were: Gas opened on Monday a little weaker, and was only moderately active. Gaslight "A" fell 1; and Imperial Continental, 1½. Tuesday was quieter; and prices throughout were good. Wednesday's transactions were mostly in Gaslight "A" at steady figures. The 4 per cent. debenture rose 2; and the buying price of the 4½ per cent. was 1 better. Thursday's business was mostly in Imperial Continental and in Gaslight secured issues, at unchanged prices. Friday was quieter, and Gaslight "A" was quoted 1 lower; but transactions showed fairly firm prices. Saturday was quiet; but quotations were not disposed to drop for want of support.

ELECTRIC LIGHTING MEMORANDA.

The Efficiency of Central Lighting Stations—Comparisons of the Cost of Electric Lighting and Gas—The Prospects of the City of London Electric Lighting Companies—The Value of Electrical Materials.

IN another column will be found a "Note" descriptive of the working results of the St. James's and Pall Mall Electric Lighting Company, to which the attention of gas engineers may be profitably directed. The data there given only apply to the working of the Company's central station during the last quarter of the past year; but they are nevertheless most instructive. In the first place, it is something for which we were hardly prepared, to observe that the whole of this particular business was done by meter, which shows that the electrical engineering of this London Company is far in advance of most others. In all America, for instance, it may be doubted if there is a single electric lighting company, besides the original Edison, that uses meters exclusively; and few English companies do as yet, although they are desirous of moving in this direction. Without consumers' meters, it is impossible to tell what becomes of the output. With them, as we see by the St. James's example, it is possible to show a ratio of useful work to the total production. According to this statement, the St. James's Company can account for all their electrical output except 2½ per cent., which is an astonishingly high duty. It means that there is practically no loss through the mains and services, and that the consumers' meters are either very good, or very good *for the Company*, which is not precisely the same thing. Upon the former and more charitable interpretation, however, it appears that the St. James's electricians have nothing more to expect in the way of technical advancement; for a duty of 97·5 per cent. from the whole plant is practically perfection. It may be noticed that the Company charge 7d. per unit for their supply, which they say costs 1·8d. in the engine-room. On the face of it, one would suppose that the margin here shown ought to be sufficient to pay for administrative and capital charges. We have already admitted that if central station lighting is to pay anywhere in England, it will pay in the choice district occupied by this particular Company.

A Dr. Louis Bell has been instructing American electricians, through the *Electrical World*, upon the subject of the comparative cost of gas and incandescent electric lighting. He states that the prevailing rate of charge by American public electric lighting companies is 1c. per hour for a nominal 16-candle lamp, which he takes as equivalent in illuminating power to an average gas-burner. Consequently, 200 electric lamp-hours are equivalent to 1000 cubic feet of gas, which makes the charge for current only correspond with a price of 8s. 4d. per 1000 cubic feet for the gas. This estimate does not take any account of the cost of the lamp, which would have to be renewed at least once for every 800 hours. That is to say, every 16-candle lamp would last as long as 4000 cubic feet of gas in burning; and its cost would therefore require to be spread over this quantity, which at 4s. would increase the cost of the equivalent gas to 9s. 4d. per 1000 cubic feet. If the electric lighting is reckoned by meter, a rental charge of ¼d., or 1c., per lamp is equal, according to Dr. Bell, to 7¾d. per Board of Trade unit. Dr. Bell also compares the cost of incandescent electric lighting with that of petroleum lamps in an ordinary dwelling-house. He finds that at rates prevalent in the States the former would only cost about one-third more than the latter. He declares that incandescent electric lighting, which is charged for throughout the United States at from 2s. 1d. to 3s. 4d. per lamp per month, compares favourably with gas at the rates charged in the same localities. We notice this statement because it affords further support to our own standard of comparison of the cost of electric and gas lighting.

It was lately stated in these columns that the prospects of the companies that are to carry out the contracts for lighting the streets of the City of London had been favoured by a notorious financial newspaper. This fact was quite sufficient, of course, for the same speculations to be fiercely attacked by other financial journals; and this has accordingly been done by *Money*. It is but fair to our contemporary to admit that it has never been given to admire electric lighting ventures; so that there is nothing inconsistent in its attitude towards the City lighting companies in prospective. The *Electrical Review* comes to the rescue of the latter in a recent issue; but it cannot be said to make a very good case for them. Taking one of these publications with another, it appears from them that the prospects of the City lighting schemes are somewhat as follows: The City authorities have agreed to double their street lighting expenditure for the benefit of the electricians, and contracts have been placed at this increased cost to the ratepayers. Meanwhile, the favoured contractors are in no hurry to do the work themselves. They wish to hand it over to new Companies to be floated for the purpose; but there is a difficulty. Heavy as the charge for street lighting is to be, it will not pay by itself. The contractors must look to such private lighting as they may be able to pick up *en route* to provide their dividends; and nobody knows as yet whether this kind of business is likely to be heavy or light. It is being perceived at length that the City of London is not, after all, an ideal lighting district, because comparatively little night work is done at the places of business, and there is no wealthy resident population. Many of the banks and other large establishments have their own private lighting installations; and although these might in time take their supply from a central station, it would be at a very low price. Moreover, everybody in the City would want light at the same time, which would be chiefly during winter afternoons. All the summer the electric street lamps would have the City to themselves, and would doubtless be highly appreciated by the few idlers to be found in the great thoroughfares at such seasons. Taking it altogether, therefore, the business of lighting the City by electricity does not look rosier upon close examination.

It was recently remarked in this column that since platinum has been so greatly in demand by electricians, the price of the metal has more than doubled; and something like a "famine" in regard to it has declared itself. Now it is reported that the same thing is about to happen with gutta-percha, which is growing so scarce that all sorts of inferior substitutes are being sold under the name; and consequently electricians are experiencing the greatest difficulty in keeping up the resistance of their insulated cables to the standard of a few years ago. Meanwhile, the value of copper is falling. These movements are favourable to the low-tension direct-supply companies now purchasing the heavy copper conductors in which so much of their capital is sunk, although the value of the mains already laid is correspondingly depreciated. The alternating current high-potential companies, on the other hand, will be more perplexed than ever if they cannot procure enough good gutta-percha to keep their output from leaking out of the mains.

GAS TRAVELLERS—A SUGGESTION.

While much has been written and said as to gas companies taking the responsibility of internal fittings—a matter upon which so many gas managers differ—there should certainly be but one opinion as to the advisability of inducing gas consumers to improve and increase their illumination. There is great reason for this just now, in view of the efforts that are being made by oil and electric light competitors to abolish the gas-bracket, and substitute their own systems in its place. There are at the present day numbers of representatives of oil and electricity travelling about the country for the purpose of praising their own wares and discrediting gas companies and the article they sell. In inclement weather, such as that lately experienced, when managers are fighting with natural difficulties of supply, and when complaints of bad and insufficient gas are abundant, these rovers reap a very good harvest. They pounce upon the shopkeeper who is suffering from a bad supply of gas or jumping lights; and then the new oil-lamp, resplendent in brass and opal reflectors, or something similar, is almost forced upon the man before he has had time to find out that his faulty gas can be improved. In very large business establishments, the failure of the gas will often result in a desire for electric lighting. It therefore behoves gas companies to have intelligent, steady, and reliable men constantly patrolling a given district, and in touch with the consumers, to prevent injury to their trade. This man may be termed a "gas traveller;" and it should be his duty to canvas a district, with the sole object of securing new customers, inducing old ones to increase their consumption, attending and advising those whose internal fittings are bad, influencing tradesmen to adopt large advertising lamps, and generally to look after the Company's interest. A gas traveller of this kind would also act as an advertising agent, as he could dilate upon the advantages of cooking and heating stoves, and probably save to a certain extent the expenses of the usual cooking lectures. It will doubtless be argued that the cost of keeping a staff of travellers would not be justified by the return. As to this, it may be suggested that the gas-meter inspectors are the men to promote to the office. Of course, the present system of employing meter inspectors varies with every company. Some inspectors, for instance, act as fitters; while others, especially in small companies, are not above turning their hands to main laying. In certain cases, however, these officers are kept practically unemployed for two or three weeks between the times for starting and finishing the readings of the meters in a district. These men have special opportunities of noting the failings of gas supply, and also the residents in their districts who do not burn gas. They mix with the public, and their labours can be increased in value by inducements being held out by their employers to study increased consumption and the general advancement of the business. There should be no reason why a meter inspector could not be paid by results. If he brings in an order from a new consumer, or for a gas-stove, or a larger sized meter, his increased interest should be recompensed by a commission. As to the class of man, he certainly ought not to be a workman, or an ordinary fitter, but a person of some higher *status*, able to converse with, and possibly influence, future customers of all classes.

The Detection of Flaws in Metal.—An instrument for detecting flaws in metal castings and forgings, which is called the "sciséophone," has been invented by Captain de Place, of Paris. The apparatus, says *The Times*, consists of a small pneumatic tapper worked by the hand, and with which the piece of steel or iron to be tested is tapped all over. Connected with the tapper is a telephone, with a microphone interposed in the circuit. Two operators are required—one to apply the tapper, and the other to listen through the telephone to the sounds produced. These operators are in separate apartments, so that the direct sounds of the taps may not disturb the listener, whose province it is to detect flaws. The two, however, are in electrical communication; so that the instant the listener hears a false sound, he can signal to his colleague to mark the metal at the point of the last tap. In practice, the listener sits with the telephone to his ear; and so long as the taps are normal, he does nothing. Directly a false sound—which is very distinct from the normal sound—is heard, he at once signals for the spot to be marked. By this means he is able not only to detect a flaw, but to localize it. Under the auspices of the South-Eastern Railway Company, a demonstration of the sciséophone was given last Wednesday by Captain de Place, at the Charing Cross Hotel, in the presence of several members of the Ordnance Committee and other Government officials. Some samples of steel, wrought iron, and cast iron, which had been specially prepared and privately marked, were tested, and in many cases the flaws therein were correctly localized by the instrument. On the other hand, some bars were broken at points where a flaw was indicated, but where the metal proved perfectly sound. Consequently, however ingenious the invention may be, it can hardly yet be called a practical success.

RATING VALUATIONS.

There is nothing more important to the gas engineer charged with the administration of gas undertakings in the United Kingdom than a proper conception of the law and practice of the assessment of this class of property for the relief of the poor. It ranks with a knowledge of parliamentary practice in placing those who are masters of it in the first grade of their profession. No man can be adjudged a really accomplished gas engineer unless he can conduct an assessment case as well as pilot a Bill through Parliament. But knowledge of this kind does not come by Nature. It has to be sought for more or less painfully; and any competent guide to it deserves to be properly appreciated. Such a guide is Mr. Newbigging, who has had the advantage of wide experience in rating appeals, especially in the North of England, where this kind of business is worked out to very fine issues. It is a mistake to suppose that the largest gas undertakings, such as those of the Metropolis, always and necessarily provide the best field for the practice of such business as that of assessment valuations. Some of these large concerns pay very little heed to the matter; putting themselves in the hands of advisers from outside, who may or may not know their work, and drawing cheques for their rates without a second thought. Not so the administrators of gas undertakings where the outgoing of every pound is watched with a proper jealousy. It is they who, as exemplified in the cases which have come into Mr. Newbigging's hands, fight out point by point the law and practice of rating. Mr. Newbigging does not hoard up his knowledge, but unfolds it for the benefit of all whom it may concern. Thus, a short time ago he published in our columns some clearly-written and intelligible articles upon the assessment of gas-works, which came very appropriately on the eve of the new valuations. These articles have now been published in a collective form.* Much of the matter has been re-written; and it has been rendered more complete by being bound up with abstracts of the leading cases governing assessments—the judgments being given in full. The little volume, which is printed in good clear type, is therefore a necessary addition to every gas engineer's bookcase. It is a compendium of the law and reason of the subject on which it treats, and worthily maintains Mr. Newbigging's reputation as a technical writer who has an instinctive conception of the precise order of information which his readers desire, and a knack of conveying it in the clearest manner.

WATER BILLS FOR 1891.

The following Bills relating to water supply undertakings have been deposited for consideration by Parliament during the present session:

The Lynton Water Bill is for incorporating a limited Company formed in 1866 with a capital of £2000, which is fully paid up, and a further sum of £400 has been expended upon the works out of profits. The proposed capital is £25,000, whereof it is desired to make £2400 the original capital. Borrowing powers are asked to the extent of £800 upon the original, and £5650 in respect of the additional capital. The source of supply is the West Lyn, which is to be weired, and a hydraulic machine is to form part of the plant, which is to be completed within seven years. The rate for domestic supply is to be 8 per cent. on the rental. The service is to be constant. The Market Drayton Water Bill is to incorporate a new Company for the supply of the town of Market Drayton, including Little Drayton, in Shropshire, who are to be bound to complete their undertaking within seven years, with a share capital of £6500, and power to borrow £1625. The supply is to be taken from certain bore-holes in the parish of Drayton-in-Hales; and the works are to be completed within five years. Rates for domestic supply are to range from 7½ to 5 per cent. The Troon Water Bill is to authorize the Duke of Portland, who at present supplies the town named, in Ayrshire, to enlarge his works under statutory guarantee. The undertakers named in the Bill are the Duke and his heirs of entail succeeding him in the entailed estates of Fullarton and others in Ayrshire. The source of supply is to be an impounding reservoir upon the Collenan Burn, and a drain from the Beattock Burn and Craiksland Burn. The service is not necessarily to be constant. The rate for domestic supplies is to be 10 per cent. on rental. The expense of carrying out the scheme is to be made chargeable upon the Fullarton estates. The County Council of Ayr may acquire the undertaking within a year after the passing of the Act; and it may also be transferred to the Troon Police Commissioners. The Western Valleys (Monmouthshire) Water Bill is to incorporate a new Company for the supply of a district including that of the Risca Local Board and part of the watershed of the Sirhowy River. The capital of the Company is to be £40,000, with power to borrow £10,000. The source of supply is to be an intake from the Nant-y-felin Brook in the parish of Bedwellty. The service

* "The Valuation of Gas-Works for Assessment." By Thomas Newbigging, M. Inst. C.E. With an Appendix of Decided Cases. London Walter King; 1891.

need not necessarily be constant; and it is to be charged for at rates ranging from 12 to 6 per cent. The Bognor Water Bill is to incorporate a limited Company authorized by a Provisional Order of 1875 to sink a well and sell water in the district named. The capital of the Company consists of £10,000, of which the sum of £8950 is paid up, and £5600 is owing on mortgage. The capital of the incorporated Company is to be £50,000, of which £41,050 is to be additional. Borrowing powers to the extent of one-fourth of the total sum are desired, to include the amount of the existing debt; but unless this is previously paid off, the Company are not to borrow any more until capital exceeding £22,400 has been paid up. The source of supply is to be a well in a field partly in the parish of Merston and partly in Oving parish, belonging to the Duke of Richmond; and the service is not to be constant. Rates are to range from 7½ to 5 per cent. The Bude Harbour and Canal (Further Powers) Bill is to authorize the Canal Company to close part of their canal as a navigation, and convert it into a water-works. The disused portions of this undertaking are to be closed as from Dec. 31, 1892, and the superfluous lands disposed of. The source of supply is the River Tamar and two brooks which already flow into the canal reservoir. New capital to the amount of £10,000 is to be raised, or in lieu thereof a loan of corresponding amount obtained.

The Dundee Water Bill is to empower the Dundee Water Commissioners to extend, enlarge, and alter their Lintrathen reservoir and the accessory works, by heightening the embankment and waste weir, which will involve several road diversions. The existing regulations respecting compensation water are to be altered. The works are to be completed within ten years. The limits of compulsory supply are to be extended. The Chief Magistrate of the burgh of Newport, Fifeshire, is to be a Commissioner in place of the Chairman of the Parochial Board of the Parish of Forgan. The Commissioners require to borrow £150,000. An agreement with the North British Railway Company for permitting the use of the new Tay Viaduct for a water-main is scheduled in the Bill. The Falmouth Water Bill is to enable the Company to raise £36,000, with power to borrow £9000, mainly for the purpose of acquiring certain mills which they are under obligation to supply with water, with a view to the extinguishing of such obligation. Power is sought to consolidate the preference stocks of the Company. The Filey Water and Gas Bill contains provisions for raising £14,000 of new capital, and borrowing £3500. The water limits are to be extended to include the whole of the township of Filey and the townships of Gristhorpe and Lebberston. Permission is sought for the purchase of water in bulk from the Corporation of Scarborough. The Fylde Water Bill is to enable the Company to raise £100,000 of new capital to bear 5 per cent. ordinary, or 4 per cent. preference dividend, with power to borrow £25,000. New works, comprising intakes from the River Calder in Bleasdale township, and Calder Dyke, are to be constructed. The necessary lands are to be acquired within five years, and the works completed within ten years. The Sunderland and South Shields Water Bill is to enable the Company to raise £500,000 of 5 per cent. capital, with power to borrow £125,000 in respect thereof. New works, consisting of two wells and pumping stations in the township of Easington-with-Thorpe in the parish of Easington, another in Seaham parish, and a fourth in Bishopwearmouth parish, and the necessary subsidiary works, are to be constructed within ten years.

The Barmouth Local Board Bill is to enable the Board to borrow £20,000 for the construction of water-works, comprising an impounding reservoir on the waters of Llyn Bodlyn, providing compensation water to the extent of 200,000 gallons daily down the Ysgethin stream. These works are to be completed within ten years. The rate for domestic supply is to be 10 per cent. on rental. The London Water Commission Bill was fully summarized in our columns on the 30th ult. (p. 1348). It provides for the incorporation of a new public authority for taking over the Metropolitan Water Supply, and is endorsed by the City Remembrancer. The Newark Corporation Bill is to authorize the Corporation to compulsorily acquire the local water undertaking; paying for it by annuities representing the shares and stocks of the Company. Additional works, comprising a well and pumping station in Farnsfield parish, are to be constructed. Rates for domestic supplies are to range from 8 to 5 per cent. on rental. The Corporation desire power to borrow the necessary money for acquiring the property of the Water Company, including £56,039 for the construction of new works, and £24,000 for general water-works purposes. The Northallerton Water-Works Bill is to enable the Local Board to construct water-works for the supply of their district; utilizing for the purpose water of the springs known as the Oak Dale Stream and Slape Stones Beck in the parish of Osmotherley. The works are to be completed within five years. Compensation water is to be provided. Rates for domestic supplies are to range from 7½ to 5 per cent. The sum of £14,000 is required for the foregoing purposes.

The Hendon Local Board Bill is of an *omnibus* character: but it contains a clause providing that, notwithstanding any special enactments to the contrary, the Board may require any company supplying water in their district to afford a constant supply at the pressure specified in the Water-Works Clauses Act, 1847; that is to say, at such pressure as will make the water reach the top storey of the highest house within the specified limits. If the Company fail to do this within six months, they are to be subjected to a penalty of £10 per day for default. The Keighley Corporation Bill is to extend the time fixed by a Local Act of 1869 for the construction of certain works of water supply to ten years from the passing of the Act. Additional water-works, comprising filter-beds and pipe-lines in connection therewith, are to be authorized, to be completed within ten years. Power is required for concluding agreements with millowners, for the use of waters, without constructing an authorized reservoir. The Corporation require to borrow £130,000 for water-works purposes. The Llanelly (Local Board) Water-Works Bill is to authorize the construction of additional works in connection with the water undertaking of the Board, comprising a storeage and service reservoir, &c., to be completed within ten years. The sum of £70,000 is to be borrowed for this purpose. The Malvern Water Bill is to empower the Local Board to construct a new storeage reservoir in the parish of Little Malvern, together with other subsidiary works, all to be completed within seven years. Under an Order of 1871, the Local Board were forbidden to levy a water-rate, but were compelled to charge for domestic supplies by meter. They now desire to alter this arrangement, and to be empowered to charge for water in any way they please; and especially to levy a water-rate in lieu of the meter charge, which is to be formally disallowed. The sum of £60,000 is to be raised for water-works purposes. The Manchester Corporation Bill contains a provision for enabling £250,000 to be borrowed for water-works purposes. It is also desired to extend the meaning of the clause of the Local Act of 1847, which permits the Corporation to supply water for other than domestic purposes on terms to be agreed upon, to the supply of water to be used for hydraulic power pressure. The Mountain Ash Local Board Bill is to enable the Board to borrow £17,000 for completing certain authorized water-works, for which an extension of time to Midsummer, 1894, is also desired. The Nelson Corporation Bill contains clauses to sanction the abandonment of their reservoirs Nos. 5 and 6, authorized to be constructed in 1888. An enactment relating to compensation water is to be repealed, and permission obtained to compensate persons in money instead of water. The water limits are to be extended. The Penmaenmaur Local Board Bill is to enable the Board to maintain the existing water-works and construct others, including an impounding reservoir on a tributary of the Afon Gyrach, to be completed within ten years. The service is to be constant. The rate for domestic supply is to be 7½ per cent. on the rental. The sum of £7000 is to be borrowed for water-works purposes. The Stourbridge Improvement Bill contains provisions for requiring the Stourbridge Water Company to sell their undertaking to the Commissioners in the usual form. In the event of such transfer, it is in contemplation to enable the Commissioners to supply hydraulic power, and to charge for water by meter if so agreed.

Reports of Gas Associations, 1890.—By an advertisement which appears in another part of the JOURNAL, our readers will see that the volume of reports of the proceedings of the District Associations of Gas Managers for the past year is now ready. In addition to the transactions of the several Associations (which occupy 392 pages, with 23 illustrations and a plate), lists of the office-bearers and members are given. The book is unform in size with the Transactions of The Gas Institute, to which it forms a companion volume.

Deterioration of Water in Reservoirs and Conduits.—At a recent meeting of the New Jersey Sanitary Association, Mr. C. B. Brush dealt with the above subject in a paper. He remarked that all water supplies are better at certain periods of the year than at others. In the hot, dry days, the water becomes dead and lifeless; and if allowed to remain at rest for any considerable length of time, algæ formations appear on the surface. These, however, are destroyed and disappear as soon as the water is put in motion. If allowed to remain, the water cures itself—the algæ disappearing after a few weeks, and leaving the water again in its normal condition. The algæ show themselves more quickly on water that has been filtered, either naturally or artificially. The author also stated that water is delivered in its best condition when taken from a running stream and supplied directly to consumers without coming to rest during its passage. Water discoloured by sediment is very often in its best condition, because the sediment is due to the fact that an abnormal volume of water is blown off from the water-sheds, and any pollution there may be is so diluted as to be incapable of harm. But there is such a demand for clear water that reservoirs are necessitated, with their attending evils. Water that is stored for 20 or 30 days commences to deteriorate. This is due to stagnation; and the stagnation begins to manifest itself as soon as the oxygen in solution in the water becomes less than 0·3 per cent. The best means of preventing stagnation consists in keeping the water in motion; and there is no better way than by forcing air into the bottom of the reservoir, and keeping the water aërated. Mr. Brush gave an interesting account of his experience with a number of reservoirs where the water had become tainted in consequence of lying stagnant; and in every instance he obviated the difficulty by forcing air into the reservoir or the mains.

NOTES.

Large Gas-Engines in France.

A report of some French trials of a large gas-engine was recently communicated to the *Engineer* by a Paris correspondent. It appears that it was the object of these tests to ascertain whether gas-engines of large size can be worked to advantage as compared with steam-engines. The economy of the coal-gas engine is confined to motors of small power; for although engines up to 50 and even 80 horse-power can be worked by coal gas with excellent results, this appears to be about the limit. A gas-engine of 100-horse power was shown at the Paris Exhibition; but it could not be described as economical when compared with a good steam-engine of equal size. With producer gas, made (as in the Dowson apparatus) with a liberal proportion of water gas, high-power engines can be worked with remarkably good results. It is stated that there is a 500-horse power gas-engine running at Marseilles, consuming in the generators only 500 grammes of fuel per effective horse power per hour. M. Witz, of Lille, recently tested the performance of a gas-engine belonging to MM. Matter and Co., of Rouen. The trials were continued for 68 hours in presence of a large number of interested visitors, so that there is no doubt about their validity. The engine was worked at an average effective power of 75·86 horses. The gas generators consumed 519 grammes of anthracite and 96 grammes of coke per effective horse power; or a total fuel consumption of 612 grammes per horse power per hour. The consumption of water was also 60·837 litres, and of oil and grease 4·20 grammes per horse power. It thus appears that, by substituting producer gas for steam, the gross consumption of material is about one-half that of a steam-engine of equal power. French engineers are reported to attach great importance to these results, as throwing light upon the future of power generation.

Mr. A. E. Seaton on Steel Boilers.

In view of the increasing use of steel in the construction of boilers, it is satisfactory to learn, on the authority of Mr. A. E. Seaton, of Earle's Shipbuilding and Engineering Company, that the bugbear of rapid corrosion has been proved not to exist where proper precautions are taken. Mr. Seaton declares that a steel boiler does not corrode more rapidly than an iron one; and, as a matter of fact, the life of boilers made of steel is likely to be very considerably longer than that of iron ones. The first steel boilers made by Earle's Company twelve years ago are still working at their original pressure, as they are likely to do for many years. This length of life is due to good treatment. The use of zinc in the form of cast slabs or rolled sheets, especially in the earlier months of their life, has been the means of preserving boilers in a way not known before; and the general practice of causing the feed water to enter boilers at a comparatively high temperature has also tended to increase their durability. The steel boiler has the advantage over the iron one that it does not develop blisters in the internal parts exposed to flame, so that the patching of furnaces is a comparatively rare thing with such boilers. The purest and softest water should, of course, be used for steel boilers.

The Efficiency of Electric Supply and Gas-Works.

Some particulars of the lighting work done for the last quarter of the old year by the St. James's Electric Light Company have been published in the *Electrical Review*. The number of lamps wired on the circuits on Dec. 31 was 13,354, reduced to the uniform standard of 16 candles, all of which were supplied without trouble during the recent fogs and severe weather. The Company present their quarter's return in the following form:

Units generated	267,443
Used on station	8,012
Sold to consumers (by meter)	252,945
Efficiency of supply $\frac{260,957}{267,443}$	97·5 p. ct.
Coal consumption	895 tons.
Coal per unit generated	7·5 lbs.
Coal per unit sold	7·7 lbs.

It is computed that the engine-room cost of the electrical energy sold according to the above statement (inclusive of fuel, removing ashes, water, oil, small stores, labour and superintendence), amounted to 1·8d. per unit. It will be observed that the electricians have a way of converting the difference between the total output of their plant and the proportion accounted for into a fraction expressing the efficiency of the plant. Gas engineers might do the same; but, as a matter of fact, they do not. The diagrams of the daily production of electricity at the St. James's station show under what uneconomical conditions an electric lighting station without storeage must be worked, for the maximum load on the machinery on ordinary days in the depth of winter, as plotted in a diagram, rises to a sharp point about 5 p.m., after which it rapidly falls—not keeping constant for an hour. Yet all the plant must be maintained on the scale of this maximum output, any shortcoming of which would ruin the enterprise.

Metallic Flexible Tubing.

Further particulars are to hand as to Almond's flexible metallic gas and steam tubing, mentioned in this column on the 23rd ult. A paper on the subject was read at the last meeting of the American Society of Mechanical Engineers. This tubing in its simplest form consists of a coil of round wire, with wire of triangular section interposed between the round coils. This triangular wire answers two purposes. It spreads the round wire coils apart, so as to exert a constant pressure on the contact surfaces, while at the same time it fills the varying spaces between the former when the pipe is bent, and thus preserves the tightness of the tube under any given flexion. This pressure brings into play the element of friction to such an extent as partly to counteract the flexibility of the tube, which will therefore retain the curve in which it may be forcibly bent. This was an unexpected and unintentional feature of these tubes, which might be more useful in some cases than in others. As the design was to secure as perfect flexibility in the tubes as possible, trials were made with closing wire of a more obtuse angle in contact with the round wire. This gave better results. A perfectly light tube has been produced by means of two round wires, with the coils jammed as in the case of the triangular wires. This makes a very strong tube; but it is too bulky for many purposes. The extent to which this kind of tubing may be bent is considerable; a piece of ¾-inch tube, tied in a loose knot, standing a steam pressure of 75 lbs. without showing a leak. For gas-stoves these tight and inodorous tubes ought to have a wide application.

Mr. H. A. Bell has been appointed Managing Director of Bell's Asbestos Company, Limited, in place of Mr. F. C. Bell, whose resignation of the position and retirement from the Board was noticed in the JOURNAL for the 6th inst.

The Advantages of Water-Meters.—In a recent issue of the *Journal of the New England Water-Works Association*, Mr. G. A. Roullier gave some particulars in regard to an experiment carried out by him in introducing water-meters in the village of Flushing (N.Y.), where he has the control of the water supply. The place has a population of 8000, who are served from works situated four miles distant, by direct pumping, through a 12-inch main. There are no manufacturing interests of any consequence; the houses being mostly residential. In 1886 the consumption rose to 120 gallons per head. With a pressure of 75 lbs. at the pumps, only 35 lbs. could be maintained at the office during the hours of maximum consumption; the two gauges being practically on the same level. As immediate action was necessary, metering was decided upon, in the face of the bitterest opposition. After considerable trouble, 100 meters were set on those services where waste was supposed to be the greatest. The pressure at once rose from 35 to about 42 lbs.; and the daily consumption per tap fell from 754 to 578 gallons. The benefits derived from these few meters were such that the system was extended, until, in 1889, nearly 47 per cent. of the taps were metered. During the year the maximum average daily consumption per tap was the same as the minimum average for the year 1886, notwithstanding the fact that in 1889 there were 232 more services in operation than in 1886. Lately the number of meters fixed was 620; and with 70 lbs. at the pumps a pressure of 50 lbs. was readily maintained in the office, and ample service furnished throughout the village. Mr. Roullier stated that the coal consumption has been reduced 400 lbs. per day. The effect of the introduction of the meter system had, he said, been that on all metered premises the adjustment of complicated rates has been done away with; disputes as to excessive use of water have ceased; simplicity and economy have taken the place of complication and wastefulness.

Sampling Gas Coal for Analysis.—Dr. D. Woodman has lately contributed to the *American Gaslight Journal* a few observations on sampling gas coal for analysis. He dwells on the importance of making a proper selection of the sample to be analyzed, seeing how much depends upon it. He says that a couple of "nice pieces" are often picked out, boxed up and sent off; and if they represent the average quality of the coal, it is either the result of accident or coincidence, or the coal happens to be extremely regular in quality. He says a sample of coal should be chosen with as much care, and by the same general method, as a sample of ore. Approximately equal portions of any convenient weight should be taken from as many parts of the cargo or general storeage heap as possible, and thrown into a small pile, which may amount to half a ton or more. The large pieces should be broken down, and the whole well mixed by shovelling. The conical pile resulting should then be divided into quarters, two opposite quarters rejected and removed, the two remaining quarters well mixed and again quartered and treated as before; repeating this operation until about 5 lbs. remain. Half of this should be sent for analysis; the other reserved and retained until no further interest in it is likely to develop. He adds that the importance of taking this trouble cannot be over-estimated, if the analytical results are to be of any real value. When a sample of coal comes for analysis in two or three good-sized, good-looking pieces, it is usually safe to conclude that they are "best selected," and not a representative average; for by the very nature of a correct sampling process, the result should be in small pieces with a reasonable amount of "slack." The chemist should then repeat the process on this crude sample to obtain a suitable quantity for analysis. That the analysis and the practical result should agree accurately is hardly to be expected under any circumstances; but misleading results may be obtained, which care in sampling would have transformed into a close approximation, both useful and satisfactory.

COMMUNICATED ARTICLES.

LUMINOUS AND NON-LUMINOUS COMBUSTION.

SECOND ARTICLE.*

By B. H. Thwaite.

Before proceeding to develop a molecular theory of combustion, it may be useful and interesting to give a brief *résumé* of the laws and explanations propounded by experimentalists on the theory of flame. The basis of this theory is that propounded by our illustrious chemist and physicist Sir Humphry Davy. This may be defined as follows: The luminosity of a flame is due to the presence of atoms of carbon which have been raised to incandescence by the thermic effect of the oxidation of the hydrogen. The non-luminous combustion of a hydrocarbon gas is due to the almost *pari passu* oxidation of the hydrogen and carbon—the former to H_2O, the latter to CO_2; both being invisible gases. The truth of these definitions will be clearly proved in this and future articles.

Davy's Theory Proved by Shadows and Solar Reflection.

Soret † was the first physicist to establish Davy's theory; and in a most beautiful manner he proved the undoubted solidity of the luminous portion of a flame. Soret applied, by means of a lens, a concentrated beam of solar luminous energy, and obtained a distinct reflection. He deduced from the result of his experiments the conclusion that, at a very elevated temperature, the carbon maintains its reflecting power. R. A. Mees ‡ repeated Soret's experiments; employing, however, a more powerful and concentrated solar beam. The mirror of the heliostat giving a too narrow beam, the solar light, which during the period of the observations had too much brilliance, was therefore reflected upon an ordinary mirror having a good reflective quality. The solar beam was then directed on to a plano-convex lens having in the centre a thickness of 41 mm., and a diameter of 190 mm. This lens concentrated and directed the solar beam on to a dark chamber, situated at a distance of 240 mm. from the face of the posterior convex. The flames to be examined were placed in this dark chamber. Thus lighted, all the flames of the hydrocarbons—gaseous, fluid, or solid—were distinctly reflected. For example, the flames of burning wood, stearine candle, *allumette chimique*, and various forms of illuminating gas-flames—batswing and round flame with glass chimney—the Bunsen flame without preadmixture of air, and petroleum oil-lamp flames, each and every one reflected a very distinct image of a blue-white colour. The reflection showed clearly the varying degrees of luminosity of the flame surface; but it disappeared totally at the obscure base, owing probably to the fact that at this level the hydrocarbons have not yet been subjected to decomposition, and are therefore still in a gaseous condition, while at a higher level, in the more brilliant part of the flame, the carbon, being liberated, is therefore found in a solid condition, and consequently reflects the solar light. In the Bunsen burner there was no reflection, because of the immediate disappearance of the atoms of carbon by oxidation. Neither the combustion of carbon monoxide gas nor yet that of sulphide of carbon gave any reflection.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

LI.

PURIFICATION (*Continued*).

In some small country works, there is provided for the liquor, one common store-tank, into which all the overflows empty, and from which the supply of liquor for the "strong liquor" scrubber is taken. This plan has the disadvantage that the alkaline "hydraulic" liquid is diluted with the neutral, or what ought to be neutral, "washer" liquid; and thus the free alkali in the former is rendered less active as a purifying agent. And the liquor when taken away for sale or use, contains an excess of free alkali; showing that its purifying properties have not been fully utilized. The hydraulic liquid should always be collected in a tank separate from the common store tank. If scrubbers are used, it will be necessary to pass this liquid through them over and over again, as the supply of liquid will not be equal to the demands of the scrubber pumps. In such case, the outlet from the scrubber should return to the collecting tank. From time to time it will be necessary to transfer a portion of liquor to the common store-tank; and it is preferable that this should be taken from the outlet of the scrubber than from the collecting-tank direct, and also that it should be drawn off in small quantities at frequent intervals, rather than that the tank should be completely emptied. It is only by such procedure that the gas can be treated with liquor of regular strength. If the collecting-tank is emptied (say) every Monday, the gas would be scrubbed with almost pure hydraulic liquor, which would gradually increase in strength as the stock in the well accumulated, until towards the latter end of the week the advantage afforded by the free alkali would be almost lost, on account of the dilution of the fresh liquor with that which is already saturated.

Having removed as much carbonic acid as possible by treatment with strong liquor, it is next desirable that the gas should have a liberal exposure to weak liquor, by which term is indicated anything below 5° Twaddel in strength. The strong liquor allows a considerable proportion (something like 30 or 40 grains per 100 cubic feet) of ammonia to pass on with the gas; and the weak liquor will take up a considerable proportion of this. But another important point is that the liquor contains a large proportion of ammonium sulphide. When used in the first scrubber or washer, the sulphuretted hydrogen is partly displaced by the well-known action of carbonic acid. Hence it is no uncommon thing to meet with a liquor of 8° or 9° strength, containing only 200 or 250 grains of sulphuretted hydrogen per gallon; while a liquor of half this strength may contain twice as much. The treatment with weak liquor is therefore directed to the securing of a reaction similar to that which obtains in the "sulphide" purifiers—viz., the absorption of carbon disulphide. Washing with weak liquor, properly applied, will absorb practically all of this substance that may be present in the gas, although it appears to be useless as regards the sulphur compounds other than sulphuretted hydrogen or carbon disulphide. The composition of these is not known; but it has been observed that they are not decomposed by exposure of the gas to heat in Harcourt's sulphur-testing apparatus; and they are usually supposed to be present to the extent of 8 or 10 grains per 100 cubic feet of gas.

The object of finishing the washing or scrubbing of the gas with clean water is to remove the last traces of ammonia. Seeing that ammonia is a comparatively valuable impurity, it is obvious that the purification should be complete in this respect. But, from this point of view only, it is a question whether it pays to be particular about the last few grains per 100 cubic feet. Two grains per 100 cubic feet are equivalent to only about 3 lbs. of ammonia—say, 12 lbs. of sulphate—per million cubic feet; or a money value of a few pence only. But it is desirable, on other considerations, to take out the whole of the ammonia in the washers or scrubbers, and especially so where the trouble of "nuisance" in connection with the purifier-house is apt to arise. The presence of a very small quantity of ammonia will have the effect of greatly increasing the foulness of the oxide or lime when the purifiers are opened. And even where there is no likelihood of trouble, the removal of only the last 2 grains would be thankfully appreciated by the men who have to empty the purifiers. But the dry purifiers, although they absorb certain quantities of ammonia, only do so incidentally; and they will not in any sense act as ammonia catch-boxes. The ammonia goes on through the holder to the consumers, and makes its presence known by corroding brasswork such as main-taps, and by acting on the valves and other parts of dry meters. If it reaches the burner, it leads to the production of deleterious nitrogen acids.

The removal of the last traces of ammonia is not a difficult matter. Pure water is necessary; but it need not have more than a reasonably moderate contact with the gas. There is a tendency to overdo the application of clean water; and sometimes a scrubber or washer of equal size to that used for carbonating will be applied for this purpose. Too much cold water, however, cannot do good, and may do harm. So there is no need to use more water than is sufficient to bring the liquor in the store well to a strength suitable for sulphate making. It frequently happens that the water used for this purpose is taken from the ordinary town supply, and therefore consists of hard spring water. Much better results will be obtained by using soft water, such as rain or condensed water. Not only is the latter more active in absorbing the impurities, but the ammonia is to some degree a "softening" agent and therefore causes a precipitate, consisting chiefly of carbonate of lime, to form from the hard water. This precipitate may be a cause of much difficulty. It accumulates and rapidly clogs any fine perforations, wire gauze, &c., that may be used in the washer. Usually it acquires a black colour from traces of tarry matters in the gas, and forms a tenacious slime that accumulates in any odd corners, such as the bottoms of seal boxes, &c. So the whole of the apparatus must be cleaned out every year or two; and this is accepted as a necessary evil due to deposits from the gas. The substitution of a soft water supply to the washer or scrubber will be found to have a useful effect in diminishing these deposits, and thus allowing the apparatus to run for several years without requiring cleaning. Under some circumstances, the spent liquor from the sulphate works may be returned to the purifying apparatus and used again. This may be resorted to where there is a difficulty in disposing of the spent liquor. Liquor that is to be dealt with in this manner should not be treated with lime or soda for the removal of fixed ammonia. The use of the former renders it practically a hard water; and any excess of free soda retained in the liquor would be apt to act upon the moving parts of pumps, wire gauze, or fine perforations, &c.

In some places, especially in foreign countries where oil of vitriol is not obtainable, it is desirable to secure the ammonia in a more concentrated form than that afforded by a 6° liquor. Under such circumstances, several courses may be followed. The use of clean water may be stopped; thus admitting of the liquor being received in the store well at 9° or 10°. This plan has the disadvantage of allowing some ammonia to pass on with

* For First Article, see JOURNAL for Dec. 16, 1890 (p. 1238).

† *Bibliothèque (Universelle Archives des Sciences)*, XLVIII., pp. 231-241, and L., pp. 243-247.

‡ *Recherches sur la Théorie des Flammes (Archives Néerlandaises des Sciences Exactes et Naturelles)*, XII.

the gas; so sometimes, where water is plentiful, it is used freely, and the weak liquor allowed to run to waste. Provided there is no difficulty in disposing of the waste liquor, this plan will secure purity of the gas. But, like the first, it is attended with some loss of ammonia; and at the best it is not practicable to obtain a liquor much higher than 10°. The best course, therefore, is to proceed in the usual way—producing a 5° or 6° liquor in the store well—and to obtain a concentrated liquor by distillation. This can be conducted with very little expense—indeed, the waste heat from the retorts might well be turned to account for such a purpose; and a liquor of 15°, 20°, or any desired strength for transit, can readily be obtained. If the liquor is to be conveyed a great distance, the saving in the cost of carriage by making one ton of water carry as much ammonia as two tons did before, will more than cover the cost involved in the distillation.

A word is needed as to the necessity of carefully preserving ammoniacal liquor from contact with, or exposure to air. Though a great deal more care is now exercised in this respect than was usual some years ago, before the manufacture of sulphate had become general, there is still a decided taint of ammoniacal liquor about many gas-works. This need not be the case. All tanks, seal-boxes, and cesspools should be supplied with closely-fitting covers; and this applies to overhead tanks on the tops of scrubbers, or for feeding washers or sulphate apparatus, as well as to those on or below the ground. Some time ago, an alarm was created by one or two explosions that occurred in liquor-tanks, probably by leakage of gas into them, or by some accumulation of gas mechanically carried in by the liquor; and a great deal was written and said about the necessity for properly ventilating such tanks. Ventilation or no ventilation, it is evidently most desirable that no gas should escape into the liquor-tanks. All seal-boxes should be of sufficient depth, and the overflow-pipes should be large, so that the liquor may run steadily and quietly through them, without surging or eddying. A good plan is to allow overflows to branch into one common cesspool or collecting-tank, from which a pipe passes off to the tank for weak liquor, or to the store-tank as the case may be, rather than to convey several pipes directly into the large wells. Where a separating-tank is used, this appliance answers the purpose. No gas-pipes should be carried over the tanks; and they should be well away from the furnaces and coke-yard. It is preferable to remove all risk of gas getting into the tanks, or of a chance of ignition of the vapours in them, rather than trust to any scheme of "ventilation" to remove combustible gases before they can accumulate to a sufficient extent to form an explosive mixture.

There is no objection to storing tar and liquor in the same tank, provided it is sufficiently large and deep to secure practical quiescence for the liquids, so that the tar may settle down at the lower part. The line of demarcation between tar and liquor, however, is not very decided; so tar should be drawn from at least a foot or two below, and liquor from a foot or two above. The overflow-pipe from the collecting-tank should not merely project just through the roof of the tank, allowing the contents to fall and splash noisily a distance of several feet, but should be carried down some distance below the level of the liquid. But unless a very large vessel, such as a discarded holder-tank, can be obtained, it is much the better plan to have separate tanks for tar and liquor, and to use a "separator." If the tank is comparatively small and shallow, the rushing in of liquids from the washers and scrubbers will agitate and mix up the contents, and prevent the tar from settling down properly. In the absence of a separator, a very general plan is to allow the condensed liquids to flow first into a tar-tank, from which the liquor overflows into a weak-liquor tank. This is practically a separator and tar store-tank in one. A little tar gradually accumulates in the liquor store-tank; and this is pumped out and into the tar-well at intervals.

Wooden Water-Pipes.—In Olympia (U.S.A.) there is in brisk operation a factory for making wooden water-pipes. It is worked by a Company, the capital stock of which is $50,000; and it is stated that the profits for the present year will more than equal this amount. Upwards of 500 miles of the pipe are now in use, in sizes ranging from 1 to 12 inches, by water companies, in mines, and for all kinds of conduits throughout the north-west portion of America. Last year something like 200 miles of the pipe were made.

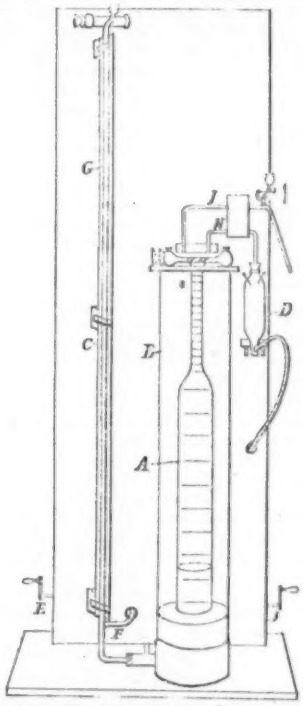
Society of Chemical Industry.—The programme of business for the meetings of the London Section of this Society for the present session contains several matters of considerable interest to gas engineers and managers. Next Monday, Mr. W. C. Young will read a paper on "Standard Sperm Candles;" and on the 16th prox., Mr. W. Mackean will deal with the subject of "Incandescent Gas Lighting." On the 6th of April, Professor Vivian B. Lewes, F.I.C., F.C.S., will discourse on "The Analysis of Illuminating Gases" and "The Products of Checked Combustion." On the 6th of May, Professor Dewar, F.R.S., and Mr. Boverton Redwood, F.R.S.E., will describe a process for the conversion of heavy mineral oils into lighter hydrocarbons suitable for illuminating and other purposes. The meetings will take place in the rooms of the Chemical Society, at Burlington House. In the Glasgow and Scottish Section, Dr. E. J. Mills will read a paper on "Destructive Distillation" on March 2.

TECHNICAL RECORD.

ADENEY'S GAS ANALYSIS APPARATUS.

At a recent Meeting of the Royal Dublin Society, Mr. W. E. Adeney, F.I.C., Curator and Examiner in Chemistry in the Royal University, Dublin, read a paper in which he described an apparatus he has devised for gas analysis and other purposes. It is shown in the accompanying illustration; and the following extracts from the paper, which was given in full in the *Chemical News*, will explain its construction.

The apparatus was originally designed to serve the double purpose of collecting and determining the gases incident to water analysis. In practice, however, it was found applicable, among other things, to gas analysis by absorption and combustion, and to the analysis of carbonates, nitrates, and organic matter by the permanganate method. It consists of a gas burette A, enclosed in a glass cylinder B, 75 mm. in diameter; a barometer tube C (which may also be employed as an open pressure-tube); and a laboratory vessel D—the whole being supported on a wooden stand, in the manner shown in the illustration. The supply of mercury to the burette and pressure-tube is regulated by means of a reservoir, which can be raised or lowered by a pulley and small windlass E fixed to the back of the stand. The flexible tube from the reservoir passes through a hole in the back of the stand, and is attached to the pressure-tube by means



of the small side tube F. The height of mercury in the pressure-tube is read off by means of a millimetre scale etched on the unsilvered surface of the narrow slip of looking-glass G, which is fixed close to the back of the pressure-tube, and inclined to the vertical plane, as shown in the drawing, so as to reflect the image of the tube from the portion of the glass bearing the scale. The burette and pressure-tube are each provided with a Friedrich's patent glass stopcock, of the pattern shown. Two branch tubes H I spring from the stopcock of the burette. The former is a capillary tube, and serves to connect the burette with the laboratory vessel D and other purposes; while the latter has a wider bore (2 to 3 mm.), and is intended to connect the vessel containing the substance to be examined with the burette. The two tubes are firmly held against the wooden block shown, which is grooved to receive them, by a brass plate lined with cork and screwed to the block. The contracted portion of the burette immediately below the stopcock is about 225 mm. long, and has a capacity of 15 c.c.; the wider portion is about 410 mm. long, with a capacity of about 250 c.c. Both portions are graduated; the former at intervals of 1 c.c., and the latter at intervals of 25 c.c. The pressure-tube is 1000 mm. long; and as it can be employed both as an open and a closed tube, a volume of gas may be measured under a pressure equal to 1500 mm. of mercury, or, on the other hand, under as low a pressure as 1 mm.

The laboratory vessel differs in principle and shape from the one employed in Frankland's or Macleod's apparatus. The lower or cylindrical portion is 25 mm. internal diameter and 55 mm. long, and is furnished with a side tube for connecting the vessel with an independent mercury reservoir. The middle portion is 45 mm. in diameter, and 100 or 190 mm. long, according to the character of the analysis to be made. The upper part, which is of an inverted conical shape, is 55 mm. long; the diameter decreasing

from 20 mm. at the mouth to 4 mm. at its narrowest part. Two platinum wires are sealed into the vessel in the positions shown in the drawing. The particular shape given to the upper portion allows the vessel to be easily connected to or disconnected from the tube H. When it is desired to disconnect, its lower portion is drawn forward sufficiently to clear the shelf, and is then lowered to detach it from the tube H. By reversing these movements, the vessel may be again attached to the apparatus. For some problems in gas analysis, the laboratory vessel may be employed in the ordinary way. The lower and open end is immersed in a mercury trough, and may be filled from the trough in the following manner. The stopcock is opened to the tube I, and the reservoir raised until the burette is full of mercury; the stopcock is then turned to open to the tube H, and consequently to the vessel. The reservoir is now lowered slowly; and as the level of the mercury in the burette sinks, it rises in the vessel. The reservoir is lowered until the vessel is full. The air drawn into the burette during the operation is driven out into the atmosphere by opening the cock to the tube I, and again raising the reservoir. When the burette is full of mercury, the glass cylinder filled with water, and the pressure-tube in proper order, the apparatus may be used in a similar manner to that of Frankland or Macleod.

Since, however, the apparatus can be employed as an air-pump similar in principle to Friedrich's new pump, as well as for measuring and analyzing gases, its applicability to a great variety of purposes becomes possible, if the laboratory vessel is furnished with the means of filling it with mercury, as well as of adjusting the level of mercury in it, independently of the burette. This may easily be effected by closing the lower end of the vessel with an india-rubber cork, and connecting it by means of the side tube to an independent adjustable reservoir, which is raised and lowered by means of the pulley and windlass J, fixed to the back of the stand, just as in the case of the reservoir furnished for the burette and pressure-tube.

To calibrate the burette, it is filled with water in the following way: The burette and glass tube H are first filled with mercury by raising the reservoir; a beaker containing water is then held under the open end of H, and the reservoir lowered until the burette is filled with water down to the lowest division-line. The beaker is now replaced by a small tared flask, and the reservoir slowly raised until the next division on the burette is reached by the mercury; the water displaced being received into the tared flask and weighed. A similar operation is repeated for each division on the scale of the burette. Finally, the capacity of the tube H is measured. During the process of calibration, the wide glass cylinder surrounding the burette is filled with water, in order to maintain the water in the burette at a constant and known temperature.

During the analysis of a mixture of gases, all measurements are carried on with the level of the mercury in the burette adjusted to the same division-line. The selection of this line will naturally depend on the volume of gas to be analyzed, and the object of the analysis. The process is conducted in the manner now usually followed with this class of apparatus. To absorb the carbon dioxide, a few drops of a strong solution of potash are introduced into the laboratory vessel thus: The stopcock of the burette is closed; the reservoir of the laboratory vessel is fixed above the level of the reagent tube; and a small pipette containing the solution of potash is connected with the india-rubber tube attached to the reagent tube. As the reservoir is above the level of the reagent tube, on unscrewing the Bunsen clamp there will be a tendency for the mercury to flow into the small pipette; and this may be taken advantage of in order to expel the air that collects in the open end of the india-rubber tube to which the pipette is attached. The air having been completely expelled, the reservoir is dropped to a level slightly below that of the reagent tube; and after a few drops of potash solution have been drawn into the laboratory vessel, the Bunsen clamp is screwed up again. The stopcock may now be opened, and the gas passed from the burette into the vessel. After about ten minutes, the carbon dioxide may be considered to have been completely absorbed; and the remaining gases may be transferred to the burette, and again measured, after the mercury has been once more adjusted to the levels as before. The remainder of the analysis does not need any further detailed description.

When commencing to experiment with the apparatus, it was anticipated that a correction for the error introduced by the bubble of gas being retained in the laboratory vessel, as above described, would be necessary when calculating the volume of the gas. In order to determine the amount of this error, Mr. J. Carson (a friend and former pupil of the author) made a number of experiments with the apparatus. About 175 c.c. of air were drawn into the burette through the tube I, the stopcock was closed, and the air was compressed until the level of the mercury in the burette reached the 100 c.c. division. The pressure exerted by the air was then found to be equal to 410 mm. of mercury *plus* that of the atmosphere—viz., 759·51—that is, a total pressure of 1169·51 mm. of mercury. The air was then passed into the vessel and back again; the mercury being returned to the same level in the burette. The pressure was read, and found to be exactly the same as before—viz., 1169·51 mm. The experiment was repeated, and a like result obtained. It was then decided to try a similar experiment with a small volume of air under reduced pressure; when the difference indicated was found to be less than 0·1 mm. It is therefore evident that the bubble of gas retained in the laboratory vessel is too small to introduce any appreciable error when the adjustments of the levels of the mercury in the burette and vessel are made, before carrying out measurements, in the manner above described.

The author gave some results, taken at random, of analyses of sewage and of air, to show the degree of accuracy ordinarily attainable with the apparatus. With reference to the possibility of maintaining it in good working order, he said he had employed it for a large number of experiments of various kinds, and had not found any difficulty in keeping the stopcocks in such good order that a vacuum could be maintained unimpaired in the burette and pressure-tube for several days. He added that other advantages of the apparatus, besides simplicity and wide range of applicability, were its comparative freedom from the risk of breakage, and its cheapness; the whole cost not exceeding £5.

THE SPONTANEOUS COMBUSTION OF COAL.

The current number of the *Journal of the Society of Chemical Industry* contains a "Note on Spontaneous Heating," by Mr. Robt. R. Tatlock, F.I.C., F.C.S., &c.

In the course of his remarks, the author refers to the spontaneous combustion of cargoes of coal. Assuming that, for every 3 cubic feet of solid coal, 1 cubic foot of air is contained between the interstices, within the space of 4 cubic feet there is 2 cwt. of coal, having a surface of at least 50 square feet, practically in contact with 0·28 oz. of oxygen, which in the act of combining with carbon to form carbonic acid would generate heat enough to raise 1 cubic foot of air to a temperature of upwards of 5000° Fahr. Of course, this temperature would never be reached in practice, as part of the heat would be communicated to the coal itself; and even if the air were quite still to begin with, the warmth would cause it to expand and ascend, and so set up a circulation of air. Some experiments were tried with a view of determining whether the sulphur, the compressed or occluded gases, or the fixed carbon compounds were responsible for spontaneous ignition. Samples of various kinds of coal were pulverized finely, and exposed to the air for twenty-four hours, so as to allow all contained gases to escape; next dried thoroughly at 212° Fahr.; and then the percentage of sulphur as sulphuric acid determined. They were afterwards exposed to a temperature of 350° for 1½ hours; and it was observed that, though this had the effect of increasing their weight by 2 per cent. (probably due to absorption of, and combination with oxygen), there was only a trifling increase in the percentage of sulphuric acid—showing that the oxidation of sulphur would not account for the increase in weight. Nor could it arise from the oxidation of occluded gases, because even if they had not been expelled by the previous treatment, the products would be gaseous, and lead to loss rather than gain of weight. So it appeared that the carbonaceous parts of the coal combined with oxygen, forming fixed substances. The 2 per cent. of oxygen, if applied for combustion in the ordinary way, would generate heat equivalent to 1 per cent. of the total power of the coal. It was perfectly evident that, though the occluded gases might possibly have something to do with starting the action, they were not in the least necessary for its maintenance.

While the usual chemical analysis of a coal, showing the percentage of hydrogen, carbon, oxygen, nitrogen, sulphur, ash, and moisture, does not throw any light on the liability of a coal to spontaneous combustion, it does not follow that a chemical examination, carried out on proper lines, might not be useful in this respect. Probably a knowledge of its proximate constituents or compounds, such as the decomposition products of the woody matter from which the coal was formed, would be of service. All that is at present known of these is that they vary widely in different coals; some being unstable, and therefore liable to chemical changes, with production of heat, while others are stable, and not prone to such change. Experiments of the kind above indicated, tried on a small scale, would give some idea of the liability to spontaneous combustion. Another point worthy of consideration is the percentage of moisture retained after being air-dried. Many kinds of coal hold as much as 10 per cent. at ordinary temperatures that would be expelled at 212° Fahr.; and this might either take part in producing chemical changes, or else a part expelled at a low heat of about 100° might leave the coal to some extent in a porous or spongy condition favourable to oxidation.

Mr. G. Weller, late of Plymouth, has been appointed Superintendent of the Lum Street Works of the Bolton Corporation, in succession to Mr. J. Boardman, who has lately resigned, after a half-century's service.

Death of Colonel R. M'C. Graham, of New York.—The death is announced, in his 61st year, of Colonel Robert M'Coskry Graham, who organized the Knickerbocker, Municipal, and Equitable Companies of New York, and also the Equitable Gas Company of Utica (N.Y.). He held the position of President of the two last-named Companies at the time of his decease.

REGISTER OF PATENTS.

Gas Checks or Taps.—Hall, W., of Birmingham. No. 733; Jan. 15, 1890. [8d.]

This invention relates more particularly to pilot light or bye-pass taps, in which the thumb plate, or the outer end of the plug is extended in the form of a cranked arm or lever, and at a right angle to the plug. The cranked arm is so arranged that, when the plug is turned off in one direction, the cranked part is brought to bear against the outer side of the body of the tap, or some portion of the pipe leading thereto or therefrom; and so a small quantity of gas is allowed to pass through the tap to the burner. In turning the lever or arm in the opposite direction, the gas is entirely turned off, on account of the position of the cranked part, allowing the plug to entirely cover the gas passages in the body of the tap.

Carburetting or Enrichment of Coal and other Gas.—Maxim, H. S., of Crayford, and Sedgwick, G. S., of Suffolk House, Cannon Street, E.C. No. 2559; Feb. 17, 1890. [1s. 1d.]

This invention is chiefly designed to provide for increasing the illuminating power of gas as it flows through the mains from gas-works. In cases where it is desired to enrich very large quantities of gas flowing through the mains, it is, of course, not practicable to pass the whole of such gas through the carburetting apparatus. According to the present invention, therefore, the hydrocarbon vapour from the apparatus is introduced either into the gas-main or into the gasholder.

Fig. 1.

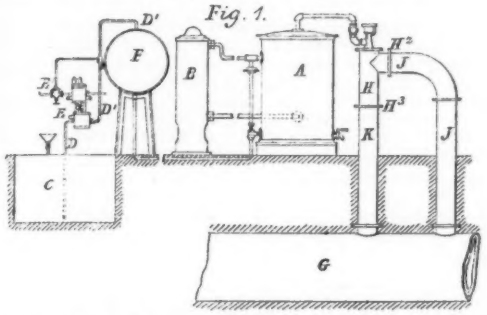
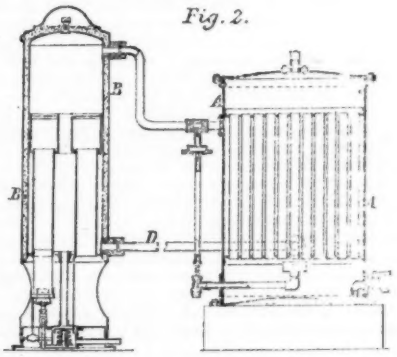


Fig. 1 is a side elevation, showing one arrangement of apparatus for drawing a portion of gas from the main, carburetting such gas, and returning it to the main. Fig. 2 is a vertical central section (on an enlarged scale), showing one form of evaporator or retort, for volatilizing the liquid hydrocarbon, connected with a boiler or heater of improved construction. Fig. 3 is a vertical central section (on a still further enlarged scale) of an injector, operated by the hydrocarbon vapour, for drawing the gas from and returning it to the main. Fig. 4 is a side elevation, showing another arrangement of apparatus, whereby provision is made for the introduction of the hydrocarbon vapour in the required quantity directly into the gas-main. Fig. 5 is a side elevation (partly in vertical central section), showing the improved boiler or heater and evaporator or retort applied to apparatus such as that described in patent No. 2508 of 1889. *

A is the evaporator or retort for volatilizing the liquid hydrocarbon. B is a steam generator or boiler for heating the evaporator or retort. C is a storeage tank for the liquid hydrocarbon, connected by a pipe D to a pump E for raising liquid hydrocarbon from the tank C, and forcing it through a pipe D¹ into a tank F situated at a higher level, so as to obtain the required pressure for forcing the hydrocarbon vapour from the evaporator or retort into the gas-main G. In the apparatus shown in figs. 1 to 3, an injector H is connected with the gas-main by pipes J K, for a purpose to be hereafter specified.

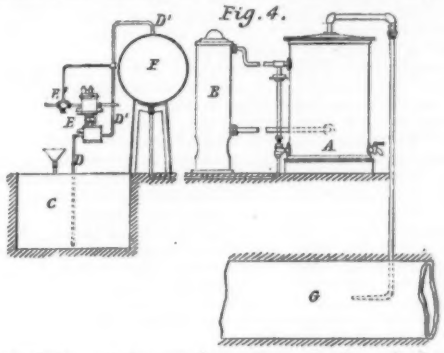
Fig. 2.



The evaporator or retort A is constructed with a cylindrical shell (fig. 2), which is closed at its upper and lower ends by plates, and is divided into three compartments by means of tube-plates. In these tube-plates are fixed vertical tubes, which extend through the middle compartment, and connect the upper and lower compartments of the evaporator or retort. The liquid hydrocarbon from the tank F is admitted to the compartment beneath the lower tube-plate through a pipe provided with a stop-cock, and the end of which within the retort is provided with a T-shaped piece for the purpose of distributing the hydrocarbon throughout the lower compartment of the retort; and thus preventing its introduction directly into the tubes at the centre of the retort. The steam from the boiler B, on being admitted to the middle compartment of the retort, comes in contact with the exterior surface of these tubes, and the water of condensation returns to the boiler B through another pipe. A third pipe is, moreover, provided for conducting the hydrocarbon vapour from the top of the retort to the injector H; and this pipe is provided with a stop-valve, for controlling the flow of hydrocarbon vapour to the injector.

Combined with the evaporator or retort is a regulating or controlling apparatus, comprising a casing provided with a flexible diaphragm (see fig. 2) in communication with the steam inlet-pipe. A valve is arranged in the pipe for the supply of liquid hydrocarbon to the evaporator or retort; and this valve is held against its seat by a spring. When the steam is admitted to the evaporator or retort for the purpose of volatilizing the liquid hydrocarbon, the pressure of the steam, acting upon the diaphragm, compresses the spring, and opens a valve so as to permit the flow of liquid hydrocarbon into the retort. It will be seen, therefore, that the valve will be opened when, but not until, the retort has been in some measure heated by the steam. Moreover, if from any cause the supply of steam should fail, instead of the liquid continuing to flow into the retort, and thus filling it and overflowing, the valve will be closed by the reaction of the spring, and the supply of liquid hydrocarbon be arrested. There is a hole through the valve or through its seat, or else some other suitable bye-pass, to permit the return of the hydrocarbon liquid from the retort if necessary.

Fig. 4.



The circulation of the gas from the main through the mixing-chamber and back to the main is effected by induction of the volatilized hydrocarbon through the medium of the injector H, as shown in fig. 3. This injector has a nozzle H¹, which can be put in communication with the evaporator or retort. In the nozzle is arranged an adjustable taper or conical valve, the screw spindle of which is provided with a hand-wheel. An inner casing or lining is secured in the outer casing of the injector, so as to form a contracted mixing-chamber therein. The outer casing is provided with a flange for connecting it to the pipe J; and with a flange for connecting it to the pipe K. The injector is so arranged in combination with the evaporator or retort and with the pipes J K, that the hydrocarbon vapour which passes through the injector will draw a quantity of gas out of the main, and force it, when mixed with the vapour, back into the main; the hydrocarbon vapour being discharged with considerable force from the injector-nozzle in the form of an annular jet, into the contracted mixing-chamber.

The boiler or heater B (fig. 2) is constructed as follows: It is provided with flues so arranged that the heated products of combustion from the burner must first ascend one flue, and then descend another, and escape a short distance above the level of the burner. The columns of air in the flues will, therefore, nearly counterbalance each other; and there will be no flow of air through the flues, or the air will move but slowly through them, when the supply of gas or other fuel is shut off. By this means the water in the heater will be maintained at a comparatively high temperature for a considerable length of time after the flame from the burner has been extinguished; the rapid circulation of cold air through the flues being prevented. The air for supporting combustion is admitted through one side of the casing below the shell of the boiler; and the heated products of combustion escape through the other side of the casing—a suitable partition or diaphragm being provided for separating the flues at their lower ends.

Fig. 3.

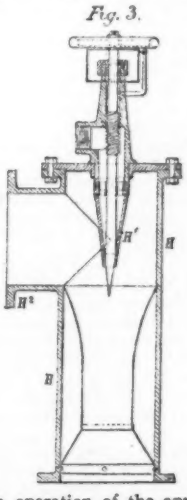
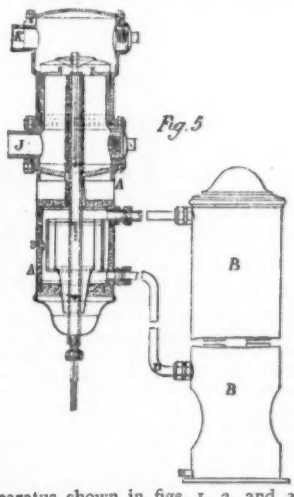


Fig. 5



The operation of the apparatus shown in figs. 1, 2, and 3 is as follows: The tank C is filled with gasoline or other liquid hydrocarbon, a quantity of which is pumped from this tank into the tank F;

* See JOURNAL, Vol. LV., p. 66.

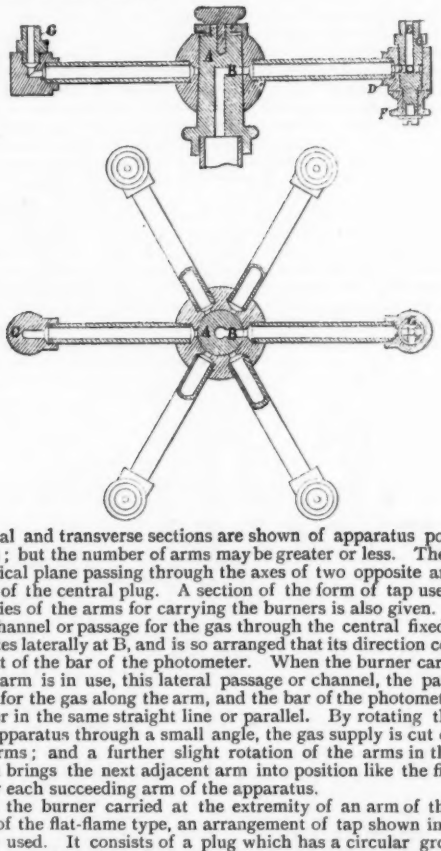
and the stopcock is then opened to permit the flow of liquid hydrocarbon from the tank F. On the admission of steam or hot water to the retort A, hydrocarbon is allowed to flow into the retort, in which it is heated by the steam or hot water as the case may be, and is thereby volatilized. The pressure thus generated in the retort forces some of the liquid hydrocarbon back into the tank F. On adjusting the valve of the injector H as required, however, the hydrocarbon vapour is forced through the nozzle in the form of an annular jet, which induces a current of gas from the main G through the pipe J, and forces the gas mingled with the hydrocarbon vapour through the pipe K back into the main, wherein the gas thus enriched becomes intimately mixed with the ordinary coal gas, and raises the candle power thereof. It will, therefore, be seen that the whole of the gas does not require to pass into or through the carburettor. By altering the adjustment of the valve K of the injector, the quantity of vapour introduced into the gas-main can be varied as required.

When the hydrocarbon vapour is to be introduced directly into the gas-main or into a gasholder without drawing a portion of the gas therefrom and returning it thereto as above described, a pipe is provided which extends into the gas-main as shown in fig. 4 (or into a holder), the end of which within the main or holder is preferably provided with a contracted mouth or nozzle. The admission of the hydrocarbon vapour is, in this instance, controlled by a cock or valve provided with a suitable index or pointer and graduated scale for indicating the extent of opening. In this arrangement, none of the gas passes into or through the carburettor.

The steam boiler or heater (constructed with the flues for the ascent and descent of the heated air or products of combustion, and provided with the regulating or controlling device as above described) can be advantageously used with carburetting apparatus such as that described in the patent No. 2508 already alluded to, or with similar carburetting apparatus, as in fig. 5. Here is shown an evaporator or retort and boiler or heater combined with a mixing-chamber and regulating bell or gasholder such as are described in the former patent. In the retort here shown the liquid hydrocarbon is admitted to the middle compartment—*i.e.*, into the space between the tube-plates—through one or more holes in the pipe; and the steam or hot water is caused to circulate through the tubes. The gasoline vapour then flows into the mixing-chamber; its admission being regulated by a valve and gasholder. Suitable means are provided for causing a portion of the gas from the main to pass through this mixing-chamber.

Photometric Apparatus.—Foster, W., of Clements Inn, W.C. No. 2671; Feb. 19, 1890. [6d.]

This invention relates to apparatus whereby the illuminating value of one and the same sample of gas can be rapidly ascertained when consumed in a number of different burners. It consists of a tap or cock, the plug of which is fixed. A channel or passage for the gas is made along a portion of the longitudinal axis of the plug, terminating laterally. Encircling the plug is a mass of metal carrying arms of equal length; at the end of each arm a particular but different burner being arranged. These arms, with the burners which they carry, rotate round the central fixed plug.



Vertical and transverse sections are shown of apparatus possessing six arms; but the number of arms may be greater or less. The section is a vertical plane passing through the axes of two opposite arms and the axis of the central plug. A section of the form of tap used at the extremities of the arms for carrying the burners is also given.

The channel or passage for the gas through the central fixed plug A terminates laterally at B, and is so arranged that its direction coincides with that of the bar of the photometer. When the burner carried by any one arm is in use, this lateral passage or channel, the passage or channel for the gas along the arm, and the bar of the photometer itself are either in the same straight line or parallel. By rotating the arms of the apparatus through a small angle, the gas supply is cut off from all the arms; and a further slight rotation of the arms in the same direction brings the next adjacent arm into position like the first, and so on for each succeeding arm of the apparatus.

When the burner carried at the extremity of an arm of the apparatus is of the flat-flame type, an arrangement of tap shown in the top figure is used. It consists of a plug which has a circular groove D; one or more radial channels being cut whereby the gas flowing along the channel or passage of the arm can enter the circular groove, and by the radial channels or passages find an outlet by the vertical passage E to the burner carried by the arm. A milled screw-head F is fixed to the plug beneath, whereby the plug (and therefore the burner) can be made to rotate through any suitable angle without in any way altering the amount of gas passing to the burner. In this way the amount of light proceeding from the flat surface of the flame, or its edge, or any intermediate position, can be readily ascertained.

When a burner is not required to be rotated, it is screwed rigidly on the extremity of the arm in the ordinary way, as at G.

The patentee remarks that he considers the foregoing the best way of carrying out his invention; but he makes two slight modifications of the apparatus: Firstly, there may be one or more lateral apertures or openings in the fixed plug, which may have a circular or annular groove at the same level as the apertures. In such a case, the gas finds its way to each and all the arms simultaneously. An ordinary tap or cock is then inserted on each of the arms at a convenient point between the burner and the fixed plug. Secondly, he reverses the relative motions of the parts of the apparatus. In such case, the arms are attached radially at one end of the plug, and the whole rotates. The gas supplied to the arms carried by the plug now passes inwards instead of outwards; the means of effecting this being in mechanical details like those already described.

Giving a Sonorous Indication of Pressure, Quantity, or Temperature of Fluids or Liquids; applicable to Gas, Steam, and other Gauges, also to Bearings of Revolving Shafts for Raising an Alarm in case of Heating, and for other Analogous Purposes.—Ford, H. H., of Macclesfield. No. 18,281; Nov. 13, 1890. [6d.]

This invention consists in a novel employment of an electric bell in conjunction with apparatus for giving a sonorous indication when a certain maximum or minimum pressure of gas, steam, or other fluid is attained, or when a given height or depth of liquid (say) in a boiler or reservoir is reached. It is applicable also for giving a sonorous indication of temperature; and is thus useful for raising an alarm when the bearings of machinery (say, of the screw-shaft of a steamer) become overheated, and for other analogous purposes.

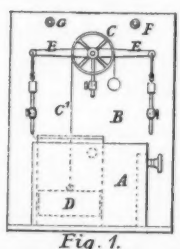


Fig. 1.

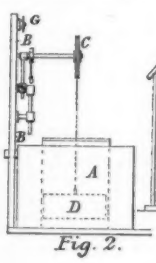


Fig. 2.

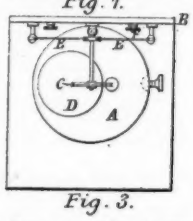


Fig. 3.

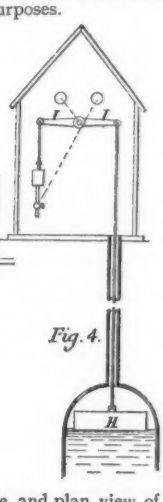


Fig. 4.

In figs. 1, 2, and 3 is illustrated a front, side, and plan view of the apparatus applied to a King's gauge A as used in gas-works, supported upon a back-board B.

To the spindle of the grooved pulley or wheel C (around which a weighted cord is passed for counterbalancing a weight, and indicating the height of the float D), there is affixed a pair of arms E; and from the extremities of the arms depend short lengths of chain. Immediately beneath these chains are a pair of metallic cups, the supporting brackets of which are in electric contact, at the back of the board B, by wires with one common terminal F of an electric bell; while the support G of the spindle of the pulley E is, by means of another wire, connected to the other terminal of the same bell.

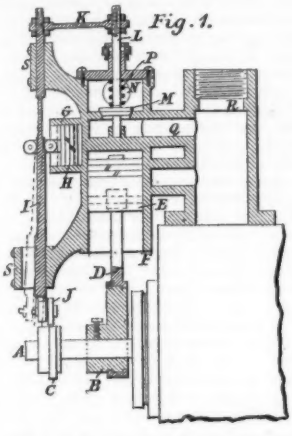
It will now be apparent that, as the float D rises and falls in the gauge, the ends of the chains will be caused to dip into the mercury contained in the cups; and thus will complete the electric circuit, and set the bell ringing. In this manner it is possible to give a sonorous indication (say) in the manager's office, or any other desired apartment, where the electric bell may be placed, of the position of the float whether too high or too low in the gauge.

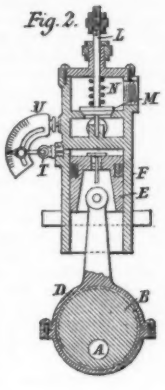
The apparatus is equally applicable for use in connection with pumps or exhausters employed for pumping gases or atmospheric air, or for indicating the level of water in a reservoir. This may be done by connecting the float H resting upon the surface of the water with one arm of a lever I, the other arm of which is provided with similar electric contact apparatus to that illustrated in figs. 1, 2, and 3.

Governors for Gas-Engines.—Boult, A. J.; communicated from W. S. Sharpneck, of Chicago, U.S.A. No. 18,645; Nov. 18, 1890. [6d.]

This governor for gas-engines consists in a peculiar construction, arrangement, and combination of parts, as shown by the central vertical sections (at right angles to each other) in the engraving.

A is a shaft carrying an eccentric B and valve cam C. D is an eccentric strap and rod connected to a piston E working in a cylinder F, on the side of which and communicating with it is a second cylinder G, containing a piston H, carrying rollers, between which works the governor-rod I, operated by a cam C bearing on the anti-friction roller J. The governor-rod is reduced at one point so as to form a spring; and it is connected by the arm K with the valve-rod L, at the bottom of which is a valve M forced down by a spring N. The valve M works in a chamber O, having a gas-inlet P, which when the





valve is open, allows the gas to pass through the inlet and through the valve-seat to the passage Q, where it mingles with the air entering through the air-inlet R, and passes to the cylinder to be exploded. The governor-rod moves in guides S S1; the latter being very much larger than the rod, so as to allow of the rod moving laterally. There is a valve in the piston E to admit air to the cylinder F above the piston. On the side of the cylinder is a relief-cock T, having an arm and pointer to indicate, on the quadrant scale U, the size of the opening through which air may pass; and thus the speed of the engine is regulated, as it is governed, by the amount of air contained in the cylinders.

The operation is as follows: Motion being given to the shaft, and the engine remaining at its normal speed, the cam C raises the valve M by means of the rods I L and arm K, which admits gas to the cylinder. At the same time the piston E is acting to compress air into the cylinders F G, against the piston H, which is held in place by the spring in the rod I, which is so arranged as to normally keep the lower end of the rod I in position to be acted on by the cam C. Should, however, the engine begin to run too fast, the air would be compressed into the cylinders F G, and the piston H would be forced outwards, and carry the lower end of the rod I and its roller J on one side, and out of the way of the cam C (as shown in dotted lines), so that the latter would not raise the valve M, and no gas would pass to the cylinder of the engine. It would, of course, then begin to slacken its speed; and when it resumed its normal speed, the piston H and governor-rod I would return to their usual positions, and the cam C would operate the valve again.

In the modification illustrated in fig. 2, the action depends on the formation of a partial vacuum in the cylinders F G, which draws the piston H inwards, and moves the rod I and its roller J in the opposite direction to that shown in fig. 1, but still clear of the cam C. In this case, the valve in the piston E should open downwards.

APPLICATIONS FOR LETTERS PATENT.

174.—Titley, J., "Improvements in pistons for gas and other engines." Jan. 5.

190.—Gray, A., "Improving gas, petroleum, and similar engines actuated by the explosion of a compressed mixture of air with gas or of air with the vapour of some combustible fluid." Jan. 5.

227.—Bickerton, H. N., "Improvements in gas-engines." Jan. 6.

297.—Bickerton, H. N., "Improvements in governors for gas-engines." Jan. 7.

375.—Mathews, F., and Feary, W. J., sen. (by his Executor, W. J. Feary, jun.), "Mixing oil or coal gas with air under pressure, and supplying the same to printers and clothworkers, to glazing and revolving 'hot' calenders, and also to gas cooking and heating stoves; and for all purposes for which gas and air is used for heating and drying." Jan. 8.

383.—Boult, A. J., "Improvements in or relating to the valve-reversing gear of gas, petroleum, and other similar engines. A communication from the Berliner Maschinenbau-Atkien-Gesellschaft." Jan. 8.

404.—Sennett, A. R., and Lavender, R., "Improvements in burners for the combustion of gas." Jan. 9.

470.—Glover, S., Glover, T., and Critchley, J., "Improvements in coin-freed gas-meters." Jan. 10.

578.—Bourgoin, N., and Decorce, H., "Improved apparatus for making gas." Jan. 12.

586.—Haitinger, L., "An improved manufacture of incandescent bodies for incandescent gas-lamps." Jan. 12.

686.—Brownhill, E., "Improvements in taps for regulating the flow of gas." Jan. 14.

720.—Haddan, H. J., "Improvements relating to the grid and gas-feed of gas cooking-stoves and the like." A communication from E. Grube. Jan. 14.

733.—Burbridge, H., "Improvements in gas-burners." Jan. 14.

764.—Rylands, D., and Potter, R., "Improvements in flues or other similar means for conveying combustible gas from the producer to the point where such gas is consumed." Jan. 15.

767.—Darwin, H., and Guthrie, J., "Improvements relating to gas cooking appliances." Jan. 15.

834.—Miller, A., "Improvements in petroleum, oil, vapour, gas, and other explosive power engines." Jan. 16.

845.—Cowan, T. W., "Improvements in gas-lamps." Jan. 16.

858.—Boult, A. J., "Improvements in or relating to lamps for illuminating purposes." A communication from J. B. F. Fredureau. Jan. 16.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Revival of the Inquiry-Circular Trouble—An Explanation.

Sir,—I am responsible for the circular referred to in your "Correspondence" column last week. It was addressed to 25 gas undertakings which are known to have had exceptional experience in hiring stoves at low rates; and it asked for information for a Committee that answers all inquiries. I have already received useful replies to most of the circulars, and have no doubt that I shall have altogether such replies to 24 of them.

It was, of course, open to your correspondent to put the inquiry into his waste-paper basket, or to object to it in terms of ordinary courtesy; and no one would have been entitled to complain. He has instead expressed his objection to it in terms which it would be mildness to call insolent, and which, to borrow a well-reputed saying, "would have been offensive if addressed by a Deity to a black-beetle." He could, however, have remembered that, in making such inquiries, I have no means of distinguishing between the generally courteous managers of gas undertakings, and the small minority who are represented by "Anti-Jack." But at some of the meetings in connection with the last anniversary of The Gas Institute held in Birmingham, I saw their type; and since then have only occasionally, and by misfortune, renewed the acquaintance.

Birmingham, Jan. 23, 1891. Edwin Smith.

The Non-Luminosity of Atmospheric Burner Flames.

Sir,—In reading through the first part of the lectures by Professor Lewes on "Gaseous Illuminants," I notice that he attributes the non-luminosity of the flame of an atmospheric burner to the cooling influence of the nitrogen. I have tried the experiment of heating the Bunsen burner tube, but could not get the luminous flame—at least, nothing that could be termed luminous. Mr. B. H. Thwaite, in his article on "Luminous and Non-Luminous Combustion," in the Journal for Dec. 16 last, states that the non-luminosity is due to the almost simultaneous and complete oxidation of both the hydrogen and the carbon constituents; and he shows that it cannot be due to cooling action, because, on injecting finely-divided coal into the Bunsen flame, the atoms are raised to white incandescence. I note that Professor Lewes says that non-luminosity is due to the nitrogen; but if the Bunsen burner is heated, there will be less of this gas flowing through, because the heat will expand the gas. The question is, Which is right?

Liverpool, Jan. 13, 1891. A Student.

Water-Rates charged upon Gross Estimated Rental.

Sir,—Perhaps I am asking a question which was practically answered either by the celebrated Dobbs case itself or by the discussion which it caused; but as I did not have the advantage of following that case, can you or any of your readers tell me, briefly, the reason why water companies, in nearly all cases, still wish to make the gross estimated rental the basis of their charges? The town in which I am interested has recently been re-assessed by the overseers, and a difference of 20 per cent. allowed between the gross estimated rental and the rateable value, instead of 15 per cent., as heretofore. In many cases, this has been done by keeping the rateable value at the former figure, and raising the gross estimated rental; the effect being that householders, although paying the same poor and local board rates as hitherto, have to pay a higher water-rate.

Now why should not a water company charge at the proportionately higher scale on a rateable value—for example, say, 6 per cent. on the rateable value of £12 10s., instead of 5 per cent on the gross estimated rental of £15?

So many companies, even modern ones, prefer to stick to the gross estimated rental that surely there must be some reason beyond custom. What is it?

Jan. 24, 1891. S.

The Price of Gas at Heckmondwike.—The Heckmondwike Local Board of Health, at their meeting yesterday week, authorized the Clerk to inquire into the powers of the Gas Company as to the sinking funds, &c., under their Acts; and also to ascertain particulars as to the price of gas, population, area of supply, capital employed, &c., of several townships in the West Riding. The matter arose out of a letter from the Company respecting the price of gas in the town, the contents of which, however, did not transpire.

The London County Council and the Water Question.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee reported, on the London Water Commission Bill, the principal portions of which were given in the Journal for the 30th ult., that the questions raised were: (1) Whether it would be proper, in the present session, to confer on a public authority such powers as would enable them to consider and deal with the water question, and in a future year to make applications for parliamentary powers. (2) To what public authority should these powers be entrusted. The alternatives were obviously: (*a*) A new public authority to be created either as a representative Commission upon the lines of the present Bill or otherwise. (*b*) An existing local authority, in which case the London County Council seemed alone available. The Committee appointed a Sub-Committee of three to attend to all matters connected with the Bill; and they recommended: "That the Council associate two members of the Finance Committee and two members of the Special Water and Markets Committee with the members appointed by the Parliamentary Committee, and that the Committee so constituted act as a Sub-Committee of the Parliamentary Committee." They also recommended that, in order to preserve the rights of the Council, a petition should be presented against the Bill. The recommendations were agreed to.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, Jan. 15.

(*Before Baron* POLLOCK *and Mr. Justice* CHARLES.)

The Lea Conservancy Board, Appellants, v. The Tottenham Local Board of Health, Respondents.

This case arose out of complaints as to the pollution of the River Lea by the flow of sewage thereinto. Similar complaints had previously been the cause of litigation; and many years ago, a suit on the subject, which came from Hertford, was tried at great length by the late Mr. Justice Watkin Williams, who was led by experts to decide against the complainants. This decision, however, did not give satisfaction, and was much discussed. Since then there have been repeated complaints of the same nuisance from various districts through which the river flows; and, as it runs along the east of London, the evil was felt at Hackney with such severity that a public meeting on the subject was held there, at which Sir Charles Russell presided, and considerable correspondence ensued. In the present case, the complaint came from Tottenham; and the evil was not so much disputed as the liability for its continuance, and whether the Tottenham Local Board were liable for it. It appeared that so long ago as May, 1884, a dispute had arisen between the Lea Conservancy Board and the Tottenham Local Board of Health as to the purification and disinfection of the sewage matter passing through the sewerage works of the latter Board within section 105 of the Lea Conservancy Act, 1868. Sir William Harcourt, then Secretary of State for the Home Department, after due inquiry, notified to them that the purification and disinfection were not being effected to his satisfaction; and in July, 1884, notice was served on the Tottenham Board, under section 98 of the Act, requiring them within a year to discontinue sending sewage or other offensive or injurious matter from the works under their control into the River Lea or its tributaries, and also to stop the discharge of the effluent water into the river or its tributaries. In the month of August, 1885, a summons was issued, on the complaint of the Lea Conservancy Board, against the Tottenham Board for having failed to comply with the notice; but no further proceedings were taken upon it. In 1885 and following years extensive alterations and improvements were, with the sanction of the Lea Conservancy Board, carried out by the Tottenham Board in their sewerage works, for the purpose of purifying and disinfecting the sewage matter. But the effluent water therefrom continued to be discharged into the River Lea at an outfall constructed for the purpose by the Tottenham Board; and such sewage works remained under their sole control until 1888. After the coming into operation of the Tottenham Local Board Act, 1888, the Wood Green Local Board and its district were constituted under that Act, and also the Joint Drainage Committee of the Tottenham and Wood Green Boards. They appointed a Clerk and an Engineer under section 11 of the Act; the Clerk and Engineer of the Tottenham Board being the persons selected. From the date of the constitution of the Joint Drainage Board down to the present time, the disposal and treatment of the sewage of both districts have been carried out under the control of the Committee at the sewerage works; and the whole of the sewerage of the Wood Green Local Board district has passed through the arterial sewers in the Tottenham district to the sewerage works, and the arterial sewers and the sewerage works have been under the control of the Committee. The value of the property apportioned to the Local Boards of Tottenham and Wood Green, and the price to be paid by the latter, have been duly settled by arbitration under the Act; but the sewerage works have not been included in the arbitration. In May last (see JOURNAL for June 17, p. 1133), the Tottenham Local Board were summoned by the Lea Conservancy Board before the Magistrates, for having, after being required by notice to discontinue the flow of sewage or other offensive or injurious matter into the River Lea or any of its tributaries, or into any cut, dock, canal, ditch, or channel communicating therewith, failed to comply with the terms of the notice, and had continued the offence contrary to sections 92 and 93 of the Lea River Act. Evidence was given that samples were taken of the effluent from the sewerage works passing into the river at the outfall, and analyses of such samples were also put in; and evidence was given as to the results of the analyses, which showed that the flow of injurious matter into the river had not been discontinued, and that the offence had been *primâ facie* made out. The Tottenham Board, however, contended that even if such matter had flowed or passed from the sewerage works into the river, they were not liable, on the ground that, the disposal and treatment of the sewage of these districts being carried out under the control of the Joint Drainage Committee, and the control of the sewerage works being vested in the Committee, the Local Board did not "cause" or "suffer" the matter to flow from the sewerage works into the river. They further maintained that the property in the sewerage works became, under the Act, vested in the Committee. On the part of the Lea Conservancy Board, it was contended that the Tottenham Local Board continued liable, notwithstanding the appointment of the Committee. The Magistrates dismissed the summons; taking the view contended for by the Tottenham Board—that, under the circumstances, the disposal and treatment of the sewage and effluent water from the sewerage works had been removed from their control. However, they stated a case for the opinion of the Court as to whether they were right in dismissing the summons on this ground.

Mr. BOSANQUET, Q.C. (with Mr. HORACE AVORY), appeared for the Lea Conservancy Board; Mr. HENN COLLINS, Q.C. (with Mr. M. LUSH), for the Tottenham Local Board.

Their Lordships came to the conclusion that the Tottenham Board were not liable.

Baron POLLOCK, in giving judgment, said the case, no doubt, was one of considerable importance. The offence charged was that the Local Board, in April, 1890, having been required by notice from the Conservancy Board to discontinue the flow of sewage into the river, did not do so, but continued it for six days. It was proved that on those days the river was polluted by sewage, and that, assuming the liability of the Board, the offence was shown to have been committed. The Board contended that, as the control was in the Committee, they had not "caused or suffered" the nuisance. The offence charged was not an offence at common law, nor under any Public Act, such as the Public Health Act, but it was only one under section 93 of the Lea Conservancy Act, which made it an offence to cause or suffer sewage to flow into the river, and authorized the Conservancy Board to give notice to "any person who shall so cause or suffer" the flow of sewage to discontinue it, upon which the continuance of it would become an offence. The notice was to be given to the persons who caused or suffered the flow of sewage into the river. Who, then, had "caused or suffered" it? It was contended that it was the Joint Committee under whose control the sewage was placed under the Act. The Act, it was said, applied as against any "corporate or other body;" and this, it was urged, would apply to the Joint Committee. There was an arrangement under which the property in the sewers remained with the Local Board; but the control was to be with the Committee. It was contended, however, that the Local Board still retained a supreme control, and that therefore they were liable. But this was a *quasi*-criminal proceeding, in which the Local Board were not liable, as they had ceased to have the control over the sewers, and so could not have "caused or suffered" the outflow into the river. It might be a question whether other proceedings might not be taken against the Joint Committee; but that was a different question, and one of great difficulty, depending on the construction of various Acts of Parliament. There certainly was no power in anybody to throw sewage into the river. The question, however, here was only as to a prosecution of the Local Board; and the Magistrates had rightly held that, though the offence was *primâ facie* proved, the Local Board were not liable to be convicted of the offence.

Justice CHARLES concurred.

Judgment was entered for the Local Board. Application was made for leave to appeal; but their Lordships said there was no appeal—this being a *quasi*-criminal proceeding.

Monday, Jan. 19.

Williams v. The Pontypool Justices of the County of Monmouth and the Pontypool Gas and Water Company.

In this case, the Court granted a rule for a *mandamus* to the Pontypool Magistrates to issue a summons, at the instance of the applicant, against the defendant Company; the Court having already in the last sittings (see JOURNAL for the 2nd ult., p. 1151) granted a *mandamus* to them to hear the case—an order which they had not obeyed. The application was for a rule *nisi* for a writ of *mandamus* to the Justices of the Pontypool Division of the County of Monmouth to compel them to grant a summons against the Pontypool Gas and Water Company to John Williams, of Pontypool, to recover penalties incurred by the Company for the non-completion of a reservoir for the supply of water for the town and district of Pontypool. Section 47 of the Pontypool Gas and Water Act, passed in 1873, required the Company, within two years and six months after the passing of the Act, to complete the reservoir so as to be capable of holding not less than 4¼ million gallons of water, and to the satisfaction of the Board of Trade. The case on the part of the applicant was that the reservoir had never been so completed, and that the Company had incurred penalties to the amount of upwards of £11,000. Mr. Williams obtained a *mandamus* directing the Justices to hear and determine his application for a summons; but they, after hearing it, refused it upon the ground that they had previously—viz., in 1879—decided that the offence was barred by the six months' limitation for suing for penalties enacted by Jervis's Act.

Mr. RUEGG, for the applicant, contended that, the offence being a continuing one, no statute of limitations could apply; and that the Justices had not heard the application on the merits. He now applied for a rule *nisi* for a *mandamus* to compel the Justices to grant his client a summons.

Their Lordships granted the application.

THE ASSESSMENT OF THE CAMBRIDGE GASLIGHT COMPANY.

Guildhall, Cambridge—Monday, Jan. 12.

(*Before Mr.* ALFRED YOUNG.)

To-day the hearing of the appeal of the Cambridge University and Town Gaslight Company against the rate made upon them by the Assessment Committee of the Cambridge Union and the Churchwardens and Overseers of the Parish of St. Andrew-the-Less was commenced.

Mr. W. C. RYDE appeared for the appellants; Mr. F. MARSHALL for the Assessment Committee.

Mr. RYDE, in opening the case for the appellants, said that they supplied gas throughout the whole of the borough, and they had also mains in some of the parishes outside the borough in the Chesterton Union. The rate appealed against was made last May; and, of course, it affected all the parishes within the borough. In all the parishes appeals were entered; but, by consent, the present appeal was taken as a test case, and all the other appeals were abandoned, although, in fact, the same question was left to be answered by the Court in substance—viz., What was the rateable value of the whole of the works and mains of the Company? The works of the Company were situated in the parish of St. Andrew-the-Less, and that was the reason why it was taken as a test case with regard to all the parishes in the Cambridge Union. Before February last the Company were assessed at £6000 gross, and £4547 rateable value. For some reason, when the valuation list was made, the respondents put down £9960 10s. gross, and £6798 rateable. Thereupon objections were made; and about 25 per cent. of the increase was taken off. The figures now stood at £8204 gross, and £5469 rateable. The figures he asked the Court to adopt were—£3956 net, and £4956 gross. The net result of the whole assessment was that the Gas Company were now rated at 20 per cent. more than they were in February last. They contended that they were over-rated, and that they were entitled to a large reduction. All gas companies during the past twelve months had incurred heavy expenses in consequence of strikes. If any proof was wanted, they could see it

in the fact that appeals were being made by gas companies in London and other places. He thought he could say from his own experience, there had not been so many appeals in the last fifteen years in London as were entered for the Sessions which were to be held in February. Therefore if any time was suitable to increase the assessment by 20 per cent., he thought a parish would be well advised to select February, 1891, as that time. The real question would turn on, What was the Company making out of their rateable hereditaments? He would put before the Court the published accounts of the Company; and he would show them that in every respect they were the actual figures, except in the case of two items; and those items were the price of coal and the cost for labour. Owing to recent events, they would form an important element in the case. He would ask the Arbitrator to take a broad view of the matter—to look forward as if he was dealing with a yearly tenant; so that, when the next rate was made, another appeal would not be necessary. He proposed to call witnesses to prove the accounts of the Company, the cost of labour, and the increased cost of coal.

Mr. *W. Peed*, the Secretary of the Company, produced the original balance-sheets; and, in answer to Mr. MARSHALL, he stated that they obtained a month's credit for their coals.

Mr. *W. Duesbury*, the Manager of the Company, deposed that for the half year ending Christmas, 1889, the quantity of coal consumed by the Company was 19,439 tons; and for the half year ending Midsummer, 1890, it was 20,132 tons. The average price per ton for the first half year was 15s. 2d., and for the second half year 16s. 2d. The Company had contracted to take coal from June, 1890, to June, 1891, at 17s. 6d. per ton. This represented a material rise in the price of coal. The Company raised the wages of their men during the past year. Thirty-four stokers were allowed a day and a quarter's pay for Sunday work; and this involved an annual loss to the Company of £103. The wages of three engine-drivers had been raised to the extent of 3s. per week; and two clerks received an additional 2s. 6d. per week. Altogether there was an increase of £196 14s. per annum for labour. There were six fitters in the employ of the Company, whose wages averaged between 22s. and 30s. per week. Two of the best rooms of the Company's premises were used for storing fittings.

Cross-examined: Witness said he did not think that two-thirds of the Company's premises were occupied by fittings. As to the residuals, there was a ready sale for coke; and it was not often they had a large stock. In 1889 the Company made 200 million cubic feet of gas; and in 1890, 206 millions.

Re-examined: The Company carried on the fittings business in premises in Sidney Street, which were separately rated. The £160 paid per annum to one of the clerks was charged to fittings account; and this appeared every half year in the balance-sheet under the heading of "fittings." The other clerk's salary, which was paid weekly, was included in the miscellaneous items. The receipts for gas consumed in stoves were included in the gas account, and not in the fittings account. The cost of laying service-pipes was placed under the distribution account. He generally spent about an hour and a half every day in looking after the fittings business. A reduction was made in the price of gas at Midsummer, 1889; and consequently the receipts had been reduced.

Mr. *Wheaton*, the Accountant of the Company, was then called. He said he did not remember Mr. Castle seeing him as to the value of the meters when he was making inquiries for the purposes of valuation. The books showed the Company's valuation at the end of 1889 to have been £3295 14s. 3d. Since 1882 the new meters had been charged to capital account; and in 1882 they were estimated, he believed, at £2100 by the former Manager. There was a difference of nearly £1200, which represented the actual money paid for new meters since that period. Nothing had been taken off for the depreciation of the new meters since that time, because the old meters were constantly being replaced by new ones. He took the life of a meter to be five years. If they were asked to supply a meter, it would be a new one; and it would not be renewed until a complaint was made. He did not know what would be a proper amount to allow for depreciation of the value of meters. The valuation which appeared in the office books was made for the purposes of account; not as a valuation between the vendor and purchaser. The price of a new meter was something like £1 14s.; and an old meter, he valued at about 5s.

Cross-examined: Witness said that in the balance-sheet for 1882, the stock of meters was valued at £2100; but how this sum was arrived at, he did not know. The following half year it was transferred from the stock account to the capital account. With regard to the late Manager, he was presented by the Company with £100, and the annuities were increased in consequence of the retirement of the late Accountant.

Mr. *E. Ryde*, a Surveyor, said he had made a valuation of the Company's entire property, and based his calculations on the accounts for the year ending Midsummer, 1890, because he thought they more nearly than any other represented the real value of the concern. The valuation he prepared showed the gross receipts for the first half year to have been £13,049, and for the second half year £14,828. Any tenant carrying on the concern could not have offices in Cambridge at a less cost to him than £100 per annum. He estimated the tenant's capital at £20,000. The tenant ought to have 10 per cent. upon his capital; and then he should, as a prudent man, put 2½ per cent. by as a sinking fund.

Mr. *Wheaton* was re-called, and in answer to Mr. MARSHALL, stated that the receipts for meters for the year ending Midsummer, 1890, were £583 18s.; and for the year 1889, £559 5s. 10d.

In cross-examination, Mr. *Ryde* said it was customary when making a valuation to take the year before making the rate; but in this case there was a difficulty, owing to the price of labour, and the additional cost of coal. An increased consumption of gas meant an increased quantity of coal required; and this took place at a time when coal was at its dearest price. Then they had one or two other things to consider—as, for instance, the higher cost of labour. He thought it was very likely that, if he made out a fresh account, he would show it not unfavourable to the Company; and admitted that, if the accounts had been taken for the year 1889, instead of 1890, the gross receipts in respect of gas alone would have been £1000 more. He considered that the fittings department had nothing to do with these accounts; it was a trade carried on separately. If the Company did not carry it on, some one else would. He thought a tenant might reasonably be expected to pay £100 per year as rent with respect to the fittings business, the profits of which were about £400; but he would not be surprised to find that a capital of £12,000 to £14,000 was required to carry it on. According to his valuation, the tenant received 10 per cent. on his capital. That which was due to the tenant was not rateable, but that which was due to the landlords was; and what they were doing then was to separate the rateable from the non-rateable parts of the property.

Re-examined: When he was before the Assessment Committee, he under-estimated the item of coals by £700; but, on the other hand, the residuals had produced a little more. The estimate was formed on what was going on at the time. The £100 he had put down as the rent of the office where the fittings business was carried on was not the actual rent now paid; but he believed the Company paid more.

The hearing was then adjourned until the following Friday, when it was resumed in London as reported below.

Surveyors' Institution, London—Friday, Jan. 16.

The proceedings were resumed in London to-day.

Mr. *E. Ryde* was further examined, and he corrected one or two statements made at the last sitting. The total amount of working expenses was £19,161, and not £18,490; the gross receipts were £18,980, and the net receipts, £8897. The practical result of taking the price of coals for the year 1890 was to reduce the rateable value of the whole property by £500.

Mr. *Corbet Woodall*, C.E., said he approached the question from the point of view of a practical gas engineer rather than that of a surveyor. He had taken the year ending Midsummer, 1890; and in many respects his conclusions were the same as those arrived at by Mr. Ryde. He estimated the cost of coals for five months' working at £17,463. He deducted from that £8600 for residual products; and this left the net cost of coals at £8863. He believed that, with the exception of these figures, his valuation was practically the same as that of Mr. Ryde. He had not dealt with the increased cost of labour. There had been an increase in the cost of coal; but there was not a corresponding increase in the price of residuals. All gas companies had been obliged to get in an extra stock of coals for the winter season because of the agitation among workmen. If they had not done this, many companies would have had to shorten their gas supply. All the coal carbonized at the Cambridge Gas-Works had to be carted about 400 yards.

In cross-examination, witness contended that, for the purposes of a valuation of this kind, the receipts ought to be taken for the same year as the expenditure, with certain modifications.

Mr. MARSHALL: That is to say, in point of fact, you would not take the price of coal for that half year at all, but for the succeeding half year?

Witness: If matters were going on in the ordinary way, I should have made no variation; but here there is a phenomenal alteration in the expenses of the Company—an alteration which I have no hesitation in saying will leave the Company without a sufficient balance to pay its dividend out of the profits of the last half year.

If it is fair to take the expenditure between Midsummer, 1890, and Midsummer, 1891, is it not fair to take the receipts for the same period?—Yes, if it was a question of quantity; but if you are to deal with receipts, and allow for a possible increase in the consumption of coal, you would also have to deal with every item in the expenditure, including not only coal, but wages, and the cost of manufacture.

Do you really suggest that the price of gas has nothing to do with the consumption of coal?—What I say is a reduction of 2d. per 1000 cubic feet does not seriously affect the consumption at all.

In regard to the tenants' capital, does it not occur to you that the fair and proper thing would be to take the residuals from the coal?—No; it does not.

In reply to further questions, witness said he took the life of a meter to be between 16 and 20 years. The stock of meters belonging to the Gas Company should be maintained from year to year at the same value; and that for all practical purposes was their full value. There were no reproductions whatever included in the expenditure of the Company.

Mr. MARSHALL: Suppose reproductions have been going on for some years, out of which account are they paid for?

Witness: Possibly out of the dividend fund. When they have a large expenditure, it can come out of their profits.

In re-examination, witness said that, supposing he were advising a local authority to take over such a concern as the Cambridge Gas Company, in making a calculation of the profits realized by the Company during the last available year, it would certainly influence him to know that since these accounts were made up, the price of coal had risen 1s. 7d. per ton. He attributed the increased consumption of gas mainly to the growth of the population of Cambridge. The tendency of the price of gas was to steadily diminish. He had no doubt whatever, if the price was increased, the effect would be immediately felt in the consumption; but he did not think the result of a reduction made as the profits allowed would be immediately apparent.

Mr. *C. Balls*, Chairman of the Cambridge Gas Company, was next examined. He said he had been a Director since 1846; and he was well acquainted with the Company's property. With the exception of one very small portion, the whole of the original works had been re-built. He was a shareholder when the price of gas was 10s. per 1000 cubic feet; and it was now 2s. 10d.

Cross-examined: The new works were erected by contract. In one case, however, the contractor did not proceed with the work to the satisfaction of their Engineer (Mr. T. Hawksley); and they annulled the contract and did the work themselves. It was paid for out of the revenue.

This concluded the case for the appellants.

Mr. MARSHALL, in opening the case for the respondents, said that Mr. Ryde had made some observations as to the way in which the new valuation came to be made by the Assessment Committee. Mr. Ryde suggested—and he thought he was perfectly accurate—that the assess-

ment had been increased by 25 per cent. He (Mr. Marshall) should say that the old valuation had been in existence a good many years; and at the time the assessment was made, it was not elicited from the Company what their actual profits and expenditure were. It was only natural that the Assessment Committee, on seeing a very considerable increase in the receipts, should consider there was something like a corresponding amount of increase in the rateable value. He found that, in the year 1873 or 1874, the receipts from the sale of gas amounted to about £17,000; while this last year they were £27,000. It was only right for him to say that this increase was made in the assessment in that round fashion, simply because the Committee had no figures to guide them; and there was no other way in which they could get balance-sheets of the Company on which they could rely; but as soon as the latter appeared before the Committee, with the able assistance of Mr. Ryde, they showed themselves anxious to reduce it. The Committee not only heard the case as put forward by Mr. Ryde, but they actually accepted his figures with one single exception. The Arbitrator would remember that Mr. Ryde, in the course of his evidence, in order to put the figures for labour and coal at what he considered they ought to be, reckoned the arbitrary sum of £1000 as representing the increase which would probably take place in regard to these two items alone. The Assessment Committee naturally thought that, if there was to be a large sum put under that head, there ought to be some allowance made on the other side of the accounts; and therefore they said they could not accept those figures. Referring to the expenditure in respect of coal, Mr. Marshall said he rather objected to the method pursued in that case, of taking one part of the year for one purpose, and some other months in the year for another. He could not help pointing out that, when Mr. Ryde was before the Assessment Committee, he said the rateable value was about £4700; when he was before the Court, on the previous Monday, the valuation he put in showed it to be £4156; and that day there was another reduction to £3597. It was possible if they went on, it would be still further diminished. This showed the necessity there was to have a fixed basis on which to work. The gross receipts Mr. Ryde put down were obviously taken at a period which was most unfavourable, inasmuch as they were for the half year which immediately followed the reduction in the price of gas. What he would suggest, and what appeared to him to be a fact, was that for some reason or another the manufacture of gas for the second half year was much larger than it was in the corresponding half of 1889. The receipts, too, in those two particular half years, were much more unfavourable than in any other half year, either before or afterwards. He suggested that the proper way would have been to have taken an average of two years. If the price of coal had increased, there was no reason why the Company should not increase the price of gas. With regard to the question of the Directors' allowances, their valuers had not taken them into account on the ground that they were landlords' expenses and made voluntarily. He apprehended that the annuities were given voluntarily by the Company; and therefore that item could not be included in the expenditure. With reference to the tenants' capital, he submitted that 12½ per cent. was an ample return for a tenant to get upon his capital. If this was so, the net rateable value would be very much larger than the sum suggested.

Mr. *Balls* was recalled, and said he made a mistake when he said the money expended for re-building certain works came out of revenue account. The re-bnilding was not done all at one time.

By Mr. MARSHALL: During the last thirty years, there had been no substantial alteration to the buildings; the works had been kept in good repair. There had been no capital expenditure since the period referred to.

By Mr. RYDE: At the present time they were erecting a new washer, in order to improve the quality of the gas.

Mr. *Castle*, surveyor, produced the valuation he had made of the property of the Company. He estimated the rateable value at £9047. He had taken the receipts and expenditure of the Company for the year 1889; and thought that was a proper period to take for the purposes of a rate made in the following year. He estimated the total receipts at £30,038; gross expenditure, at £17,057; and the net profits, at £12,981. He put the tenants' capital at £11,356.

Cross-examined: With regard to the Company's property in Sydney Street, witness said he supposed they were separately rated for that. They had in the balance-sheet the sum of £100 as rent; but he did not know what this sum included. For these premises he had allowed £100 for rent; but had not taken the rates into account. He had taken the fittings business and the gas-works as one concern. Asked whether he took the accounts of the year and then looked forward, he said he did so as far as regards the coal, but not the servants. As to the present of £100 to the Company's old Manager, he said that he knew every tenant would not like to give £100 to every one of the old servants; and he was of opinion that the annuities ought not to be allowed.

Re-examined: He regarded the fittings business as part and parcel of the Company. The receipts from gas were augmented by the receipts received from the sale of stoves.

A lengthy discussion took place as to the method Mr. Castle had adopted in making his valuation; Mr. Ryde observing that, if the valuation he had put in was correct, Mr. Castle had under-estimated the expenditure by £1000.

Saturday, Jan. 17.

Mr. *Castle* was to-day further cross-examined. He said the gross expenditure, £17,057, was based on the assumption that the figures he put down for coal purchased were correct. He was of opinion that £200 was quite sufficient for a tenant to spend on chattels. He had had the management of gas-works; and he had no doubt that the Company's present buildings would last 100 years.

Re-examined: The receipts from the sale of gas and the residuals during April and the first half of May would be sufficient to supply the necessary capital. The hypothetical tenant's profits of £1670 was arrived at by the calculation of the profits which had been paid in dividends. The shareholders were bound to get a return for their money invested; and if they could not get it when the charge for gas was as 2s. 10d. per 1000 cubic feet, they must increase the price.

Mr. *W. A. Mason*, surveyor, said he had had a great deal of experience in regard to gas-works. He had made a careful inspection of the Cambridge Gas-Works; and he found them to be in a first-rate condition. He had taken the same basis as Mr. Castle for the valuation; and that was the only one that the Overseers or the Assessment Committee had in coming to a conclusion. Assuming that they had an idea at the time that the price of coal was likely to rise, he did not think that would alter the basis of the valuation, because the Company could raise the price of gas, if they found they were getting insufficient profits to pay the maximum dividends. The same observation, of course, applied to any probable increase in the amount of wages. With reference to gas-fittings, the Company possessed the power to sell them; and he thought it would be impossible to sever that business from the gas-works. Attention had been called to the figures which appeared in the Christmas accounts of 1889, showing that at that time there was due to the Company £11,500; but those figures did not make any difference as to the amount of the tenant's capital. It was exactly what he estimated would be owing to the Company in his valuation. In his accounts it was shown that there was owing £11,603; but it did not necessarily follow that the tenant wanted that capital. Part of the £11,500, in point of fact, was profit, and part only working expenses. Witness further stated that he allowed 10 per cent. on the tenant's capital, and 17½ per cent. on meters and chattels. Looking at the efficient state in which the works were, he thought no repairs would be necessary for some years. He had drawn his conclusions as to the rateable value of the property from the dividends paid by the Company.

By the ARBITRATOR: The rate was based on the reduction made by the Assessment Committee.

Cross-examined: Witness said he had satisfied himself that the Company had throughout paid their dividends. He was aware that in 1874 a dividend of only about 4 per cent. was paid; and that was at the time when the price of coal was high. He did not think that if the cost of coal was raised this year, the dividends would go down, because the Company had £1000 in hand. He had allowed no deductions in respect of the additional cost of coals or labour.

Mr. RYDE remarked that, with regard to the much-vexed question of coal, he despaired entirely in pointing out the difference between their accounts and those prepared by witness. Some discrepancy had crept in; and they were unable to find out where it was.

In further cross-examination, witness admitted that he had made no addition to the hypothetical tenant's capital in respect of the quarter's rent. He did not know of any instance where interest as low as 10 per cent. had been allowed on the tenant's capital in reference to gas-works. In his valuation, there was a balance owing to the bank of £4754 at the end of the hypothetical tenant's first year. He believed a bank would allow a tenant who had no more capital to run into debt to this extent, because gas supply was a very sound monopoly. He did not think that if an electric light company obtained a Provisional Order, it would seriously affect the Gas Company. The Corporation, he believed, already possessed an Order; and he was told that one or two colleges had systems of electric lighting of their own. He did not find, however, that it had had any effect on the dividends of the Gas Company.

Mr. MARSHALL, in summing up the case, remarked that whether the Arbitrator took his stand upon the year 1889, which they said was the proper year to be taken, or the last half of that year and the first half of the following year, and considered the full and proper receipts as against the expenditure, he would have no difficulty in supporting the rate which the Assessment Committee made.

Mr. RYDE submitted that the accounts for the year ending Midsummer, 1890, would represent the existing occupation to the existing occupiers—namely, the Gas Company. He had proved that circumstances had undergone a change; in other words, he had shown the increase which had taken place in the cost of coal and labour. He contended that 17½ per cent. was not an extravagant figure to allow for a tenant's capital. With regard to the Directors' fees, if that item were allowed, his learned friend had not suggested that £300 was an exorbitant sum. He thought that the part of his case which referred to the hypothetical tenant's capital had been well established.

This concluded the hearing; and the Arbitrator intimated that he would reserve his decision.

Cirencester Gas and Water Companies' Orders.—The Cirencester Tradesmen's Society have, after consulting a "London expert," resolved to submit a draft of objections to the local Gas Company's Provisional Order; the chief points being the following: The proposed increase of capital of £10,000 is regarded as too large; it is asked that the standard price for gas be 4s., and not 4s. 9d.; that new capital shall be issued at 6 and 5 per cent. (ordinary and preference), instead of 7 and 6 per cent., as proposed by the Order; and that a clause be inserted giving the town power to buy the gas-works by arbitration, the arbitrators to give no increase in price by reason of the Company having obtained the parliamentary powers now sought. The Society have further decided not to oppose the Water Company's Order.

Electric Lighting for Bristol.—The Electric Lighting Committee of the Bristol Town Council further considered last Wednesday the report of Mr. Preece on the scheme for lighting the city. The report proposes that in the narrow streets the arc lamps shall be suspended from the centres of arches 30 feet high, and in the wider thoroughfares the lamps shall be placed in the centre of the roads on standards of the same height. The Committee have made arrangements by which a portion of the site for the installation can be entered upon by March 25; but they have decided to ask Mr. Preece for additional advice as to the style of plant that should be laid down. They have also agreed to add £5000 to the original estimate on account of the probability of work in respect of the foundations of the site in question being necessary. This will bring the total estimated cost to £60,000; and for this sum the Committee believe that an adequate installation can be secured for lighting the area contemplated as brilliantly as Florence and Milan are lighted. The machinery will be of 1200-horse power; and this, it is stated, will give sufficient force for 100 arc lamps and 10,000 incandescent lights.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The following reports, with the accounts showing the working of this Company during the six months ending Dec. 31 last (to be given next week), will be submitted to the proprietors at the half-yearly general meeting to be held on the 6th prox.

Report of the Directors.

The accounts for the half year ending Dec. 31, 1890, are herewith submitted.

After providing for all fixed charges, a balance of £209,895 6s. 10d. (including £7392 16s. brought forward from last half year) remains applicable to the dividend on the ordinary stock of the Company.

The current price of common gas being 2s. 9d. per 1000 cubic feet, the statutory dividend under the sliding scale is 13 per cent., which dividend the Directors recommend be declared. The reserve fund, applicable to the equalization of dividends, now stands at £531,395 5s. 4d. To meet the dividend, it will be necessary to withdraw from reserve the sum of £145,695 12s. 2d.; leaving a balance of £385,699 13s. 2d.

The exceptionally high prices of coal and cannel during the past half year have had an adverse influence upon profitable working. The half year has also borne to the full extent the heavy additional outlay for wages now paid to all classes of workmen. The labour difficulties with which the Company was threatened at one period of the half year happily passed away without serious dispute; and the Directors feel satisfaction in reporting the present existence of friendly relations with their employees.

The increase in the sale of gas during the half year, amounting to upwards of 5 per cent., is no doubt largely due to the excessively dark weather which has prevailed since the middle of November; but the extension of the daylight use of gas for fuel is very marked, and demands a corresponding provision of the means of production.

To keep pace with the steady growth of the Company's business, the Directors are now engaged in the erection of enlarged and improved carbonizing plant; and the additional capital to the extent of £300,000, now being raised, is required in respect of the expenditure so incurred.

The attention of the shareholders has been already directed to the excessive local taxation which they are called upon to bear. The Directors are availing themselves of the opportunity of the quinquennial re-valuation to appeal to Quarter Sessions for relief.

Several measures have been introduced in Parliament affecting the interests of the Metropolitan Gas Companies, all of which will receive the attention of the Directors with a view to the protection of the Company.

WILLIAM THOMAS MAKINS, Governor.

Horseferry Road, Westminster, S.W., Jan. 19, 1891.

Engineer's Department.

I beg to certify that the whole of the Company's gas manufacturing and storeage stations and also distributing plant under my charge have been kept in good repair and efficiency during the past six months. Considerable progress has been made during the last six months in the extension of the manufacturing and storeage power of the Company, in order to meet the increasing consumption of gas.

G. C. TREWBY, Chief Engineer.

Distribution Department.

I hereby certify that during the past half year the whole of the distributing plant under my charge has been maintained in a thorough state of repair and efficiency, and the various pressures of gas have been well regulated.

G. F. L. FOULGER, Chief Inspector.

Products Department.

I hereby certify that the whole of the plant, engines, boilers, stills, trucks, machinery, and tools in connection with the Company's products works under my charge have during the past half year been maintained in good working order and repair.

THOS. WILTON, Superintendent of Products Works.

THE GLASGOW GASHOLDER DISASTER.

Our Glasgow Correspondent, writing on Sunday in reference to the gasholder disaster mentioned in last week's issue of the JOURNAL, said: In order to get the latest information regarding the extraordinary and destructive collapse of the two large holders at the Dawsholm works of the Glasgow Corporation Gas Commissioners, I paid another visit to the scene late yesterday afternoon, and am now in a position to give some details that were not available a week ago. The time that has since elapsed has been a period of great anxiety, alike to the Works Sub-Committee and to Mr. W. Foulis, the Engineer-in-Chief to the Gas Commissioners. The investigations which are in progress with the view of elucidating the mystery, and which may be said to be three in number, have brought into the field several persons of importance, most of them experts of distinction in their respective spheres of work. The Corporation Sub-Committee on Works have had the following to assist Mr. Foulis in noting the actual facts of the case, and in endeavouring to get at some feasible explanation of the prime cause of the explosion of No. 2 holder, the one which first gave way: Mr. George Livesey and Mr. Gillespie, both of whom I mentioned in my communication last week; Mr. Charles Hunt, of Birmingham; Sir William Arrol, who in his early manhood was in the service of Messrs. Laidlaw, Sons, and Caine, of this city, extensive contractors for gasholders; and Mr. Lundholm, Manager of Nobel's Explosives Works. Mr. Livesey returned to Glasgow last week, and was busily engaged during most of Friday giving his professional help.

Some of the data that have been satisfactorily determined during the week may now be mentioned. Holder No. 2, which was the first to "give out," stood at the time at a height of about 66 feet; and the height of its neighbour, No. 1 (only a few feet distant), was about 70 feet. So that it will be seen that all the three lifts of each holder were actually working; and it is stated that the total quantity of gas in store in the two holders was about 2,800,000 cubic feet. The tanks having been completely emptied, the damage to the sides as well as the top has been ascertained. The guide-framing of both holders is practically intact, unless at the position where the guide-rollers were at the moment of the accident. Here the guides are crushed and bent, and in some places completely punched; thus showing very severe local strain at the instant of the explosion. It should be mentioned, in reference to the ripping of the sheets and plates, that those which have suffered most are the thick plates at the outer edge and in the centre, rather than the thin intermediate sheets. Everything appears to point to a very severe concussion, which lasted only for a short space of time. Further examination seems to show that the ruptures in the wall plating of the middle and outer lifts were produced simultaneously with the collapse of the crowns of the holders, and were not the result of the fall into the respective tanks. It is found that rivet-heads, which were burst away at the moment of the collapse, are lying opposite each principal rupture, and at considerable distances from the edges of the tanks. The internal framing supporting the crown is much shattered. In the further progress of the examination of the holders, it has been found that, at a distance of 12 or 15 feet in from the edge of the tank of No. 2 holder, there is a very irregular rupture, which is from 15 to 18 inches long, with a varying width, and that the edges of the sheets at this fracture, in all directions, are curled inwards—being just such a rupture as would be made by a charge of dynamite or other similar explosive; and it seems almost certain that this was the initial cause of the disaster. In the immediate vicinity of this rupture the sheeting is violently corroded, as if there had been *chemical* action immediately following the mechanical action of the rupturing agent.

MANCHESTER CORPORATION GAS AND WATER SUPPLY.

The Thirlmere Water-Works and the Gas Profits.

The proposition of Sir John Harwood, to apply some of the profits of the Manchester Corporation Gas Committee to the purposes of the Water Department, has aroused a good deal of interest in the city; and the local papers continue to publish correspondence thereupon, from which it appears that it is generally regarded with disfavour. Last week we gave the gist of two letters, the writers of which were strongly opposed to the proposal; and it will perhaps be interesting to many readers to give to-day an article which has appeared in the *Manchester City News* containing the views of "The Author of 'Greater Manchester'" on the subject, which, as will be seen, are favourable to Sir John's scheme. The following is the article:—

Sir John Harwood has told us how he proposes to give to the citizens of Manchester an abundant supply of pure water without asking for an increase of the water-rate; and his proposal to set apart a portion of the gas profits towards the expenses of the Thirlmere water supply has met with some hostile criticism at the hands of sanitarians. The proposal has merits which are not apparent at first sight. Hence the critics ask: Why have we gas profits when we make the gas and sell it to ourselves? And so these "profits" are designated a fiction which it were better to remove by selling gas at cost price. To sanitarians we would say, Water is a prime necessity to all; water in abundance is a sanitarian more active than all "societies," good, bad, or indifferent. Gas is not a prime necessity to all, as may be proved any day at the Town Hall, where the inquirer may be informed that 50,000 ratepayers do not use it. But before we begin to worry ourselves about so-called fictions, which, on inquiry, resolve themselves into stern facts, had we not better employ our energies to the improvement of our gas supply, and so perfect it as to make it a pleasure, if that be possible, to use it when it is supplied. The progress during the last ten years made in the lighting of our streets and houses has shown itself almost everywhere except in Manchester; and in this respect Manchester is little "greater" than the agricultural town or the manufacturing village. Indeed, we may almost say that we have been standing still whilst we have been accumulating large "profits" of the business. Save and except the erection of a few Bray lamps in some of our principal streets, a progress for which we are grateful, there has literally been no advance in this department of our social economy; and there may any night be seen in some of our main roads just sufficient gaslight to make darkness visible; the street lamps being from 70 to 100 yards apart, containing burners which, from the light they diffuse, may be put down as number one and a half. The latest official statement put forth by the Gas Department a few days since informed us that on Christmas Eve, when more gas is used than on any other day in the year, the supply of that article was exhausted, "and gas was being sent out of the works as it could be made." A contemporary says "its quality has been far from satisfactory." That this is so, few who use gas will be prepared to dispute; and those whose literary work is pursued between sunset and sunrise know to their cost what a consumption of sight goes on in consequence of deficient light in those hours. Some of us who literally "burn the midnight oil," have substituted for gas the Belge petroleum lamp, by which is obtained a better light and at the same time a purer atmosphere; but is it creditable to our Municipality that gas should be both deficient in quantity and quality, and dear into the bargain? The cause is, however, not far to seek. The Municipality has no competitor; and where competition is excluded we find, as a general rule, stagnation if not decline, and an indifferent article. But this should not be so as regards Manchester, which has a reputation for leading the way in municipal enterprise. The report previously referred to says: "The number of complaints as to the supply of gas received at the Gas Office from the 15th to the 27th of December inclusive was 1291." Deficient in both quantity and quality, we are surprised that the complaints did not reach ten times that number; deficient too at a time, or at times, when the light is most required—viz., upon foggy days or festive occasions. In recent years gas has been in demand for motive

power; and the little "Otto" engine may be seen any day at work within a few yards of the Exchange, making its revolutions with surprising ease and surpassing cleanliness. An effort has also been made by the Corporation and others to encourage the use of gas in the place of coal for heating and cooking, in the hope thereby of reducing the smoke nuisance and of adding to the purity of our Manchester atmosphere. These efforts will, however, be unavailing if it is understood that the gas supply cannot be relied upon, and that at any moment, without warning, it may altogether cease. But is not this limited supply of an inferior article a short-sighted policy on the part of our executive? And ought we in the year 1891 to be lamenting our deficiency in street and house lighting? The injurious effects of bad or impure gas upon works of art, books, and upon our own health are well known; and it needs no effort on the part of the Municipality to induce consumers to adopt some other mode of supplying the artificial light we in Manchester so much need. Returning to the subject of profits, it may be pointed out that it is erroneously assumed that the vendors of gas and the purchasers of gas are the same persons. The gas-works are the property of the ratepayers as a whole. The gas consumers are a portion of the whole; and, therefore, there does not appear to be any logical reason why the 50,000 ratepayers who do not consume gas should be excluded from participation in the profits which their property makes, especially when it is remembered that the gas-works have been erected with their money, and that their incomes and property are mortgaged as security for the repayment of the capital. If, then, the gas profits derived from a portion are the property of the whole body, the whole body being consumers of water, why should not those profits be applied, as in the case of the markets, for the benefit of the whole. It may be objected that, in municipal finance, it ought to be laid down as an axiom, that "every tub should stand on its own bottom." With this axiom I agree; and, provided the area and persons benefited are the same as the area and the persons taxed, I would rigidly adhere to it. But we are a long way off this consummation; and we might as logically object to the crediting of the city fund with market profits, as to the crediting of the water fund with gas profits. One of these funds must be credited, if profits are to be made. Is there any principle involved in the selection? I think not, and that Sir John Harwood is right, and that the demand for the supply of gas at cost price is not well founded.

PARA GAS COMPANY, LIMITED.

The accounts of this Company for the six months ended Sept. 30 last have been circulated among the shareholders, together with a copy of the previous half-year's balance-sheet. The revenue account shows a net profit of £3252, which with the amount at the credit of profit and loss, after writing off the amounts sanctioned at the last general meeting, makes a balance of £5442 18s., out of which the Directors recommend the payment of the usual dividend on the preference shares. Owing to the unpunctuality of the Government in paying accounts at dates when due, the Directors state, in their report, that they cannot recommend at present a declaration of a dividend on the ordinary shares. This unpunctuality is the cause of serious trouble to the Company, as not only is the loss in exchange (amounting in the past half year to no less than £1056 11s. 1d.) repudiated, but no interest is allowed by the authorities on overdue accounts. It is also stated that fines continue to be arbitrarily exacted, notwithstanding the distribution of 15-candle gas as against 10 candles, which the concession calls for, and notwithstanding every possible care being taken to make the lighting perfect. Owing to the sickness of every British member of the Company's staff, great anxiety has been caused. The Manager (Mr. J. Gibson Newbigging) is still at home invalided; but the Directors mention that they have been fortunate in securing the services of gentlemen in whom they have the fullest confidence to fill the vacancies, and are satisfied that the interests of the Company are thoroughly attended to. The Acting Manager (Mr. J. Fallows Cocks) reports that the works are being maintained in a satisfactory condition.

LEICESTER CORPORATION GAS SUPPLY.

The Salary of the Gas Engineer.

At a Special Meeting of the Leicester County Borough Council last Thursday—the MAYOR (Mr. Alderman Kempson) presiding—the Gas Committee reported that they had received an application from Mr. Alfred Colson, the Engineer and Manager, for an increase of salary. Mr. Colson had held his office for more than eight years; and his salary was increased in September, 1888, from £750 to £900 per annum. Having regard to the highly satisfactory manner in which Mr. Colson had discharged his duties, and to the increased responsibility cast upon him in connection with the construction of the extensive new works, as well as to the financial success attained under his management, the Committee recommended that his salary be increased from £900 to £1000 per annum.

Mr. LENNARD, in moving that the report be adopted, said that the recommendation came unanimously from the Committee. He might mention that since 1882, when Mr. Colson became their Manager, the work of the department had very considerably increased. In seven years, up to the end of last year, it had been augmented by no less than 60 per cent.; and the make of gas had reached the enormous total of more than 1000 million cubic feet. This in itself was a very large increase; but it did not anything like represent the extra amount of work and responsibility falling upon the shoulders of Mr. Colson. The make of gas was largely a routine matter when once the works, or plant, had been scientifically and properly constructed. The increase in the production of gas did not mean so much in itself; but they had to consider that it represented a proportionate increase in the amount of coal, &c., that had to be purchased, and in the quantity of material that they had to dispose of, which were matters of daily commerce. They now turned over something like £100,000 a year in gas; and besides this, they had £100,000 worth of residuals, &c., to dispose of. If it were not for this, it would not have been his privilege, and the privilege of others who had preceded him, as Chairman of the Committee under whom Mr. Colson worked, to have stood there so many times to move the adoption of such splendid balance-sheets as they had in connection with the gas-works. When Mr. Colson came to Leicester, the chemical works were being carried on—well, not very satisfactorily; and he undertook to manage them. By this action, they not only saved the £450 a year which was being given to the Manager of that department, but they had the work done considerably better, and the profits had been largely increased.

Mr. BILLINGS seconded the motion.

Mr. NEALL, in supporting the recommendation, remarked that since Mr. Colson had been in charge of the works, the rateable value had gone up just 100 per cent.—it had increased from £3500 to £7000.

Mr. INSKIP spoke strongly against the recommendation (1) because he thought that the present salary of Mr. Colson—£900—was quite sufficient; (2) because he thought Mr. Colson had been very ill-advised in making his application at that juncture, when there were hundreds of ratepayers, or those who had to contribute towards the rates, absolutely starving in the town; and (3) because of Mr. Colson's conduct towards those who laboured under him.

After further discussion,

Mr. LENNARD said, in reply to Mr. Inskip, that if any man placed in an official position was ever respected by every workman under him, it was their Gas Manager. Mr. Colson did everything he could for the men both professionally and unprofessionally; and he believed they all loved him.

The motion was carried; only Mr. Inskip dissenting.

ELECTRIC LIGHTING IN LIVERPOOL.

The members of the Liverpool Engineering Society last Wednesday visited the central station of the Liverpool Electric Supply Company, and were conducted over the Works by Mr. A. Bromley Holmes, C.E., one of the Company's Engineers. Afterwards an ordinary meeting of the Society was held at the Royal Institution, when Mr. Holmes read an interesting paper describing the machinery and appliances now in operation in Liverpool for the supply of electricity. He said that at the date of the formation of the Liverpool Electric Supply Company in January, 1883, there was not a single installation of incandescent lamps in Liverpool; and the first building lighted by this means, in July, 1883, was a restaurant in Eberle Street, where the current was generated by a gas-engine and dynamo on the premises, and the light supplied at a fixed annual charge. In 1889 the Company's new works, offices, and central station were built; and the supply of electricity began in October of that year. As showing the rapid extension of electric lighting in the city, he mentioned that the number of lamps of 16-candle power (or their equivalent) connected with the Company's stations was on Jan. 1, 1888, 977; Jan. 1, 1889, 3330; Jan. 1, 1890, 6711; and Jan. 1, 1891, 11,750. The capacity of the three stations now at work was: Highfield Street, 7000 lamps; Harrington Street, 4000 lamps; Oldham Place, 4500 lamps—total, 15,500 lamps. These capacities were capable of extension to a total of 37,000 lamps. The system in use was a direct current continuous supply at a pressure of 110 volts; all the mains being in simple parallel. Proceeding to describe the plant in detail, Mr. Holmes stated that the dynamos for the smaller engines gave an output of 300 amperes, and an electro-motive force of from 110 to 140 volts, at from 450 to 500 revolutions per minute. The larger dynamos gave 900 amperes, and from 115 to 135 volts, at 375 revolutions per minute. The accumulators had lead containing boxes, each about 4 ft. long by 12 in. wide and 13 in. deep, supported on heavy wood slabs resting on glass insulators. The maximum safe rate of discharge of the cells was 250 amperes, and the storeage capacity about 1700 ampere-hours at ordinary rates of discharge. All the distributing-mains of the Company were laid underground. The largest feeding-mains were composed of 91 No. 9 wires, and had a sectional area of 1·57 square inches. The ordinary feeders were of 61 No. 11 wires, with an area of $\frac{1}{8}$ square inch, and the distributors of 37 No. 13 wires $\frac{1}{4}$ inch in area. The mains were laid in cast-iron troughs $\frac{1}{4}$ inch thick, and about 6 feet long, with socket joints; the general arrangement of mains being as follows: A pair of distributing-mains were laid under the footways on each side of the street, and were joined together to form a complete distributing network, to which were connected all the service lines to consumers' premises. The supply of current was brought to selected distributing points in this network by heavy feeding-mains, which ran direct from the generating stations. As a matter of practice, it was found that the hours of demand varied in different streets and districts; and it was found necessary not only to vary the station pressure as a whole, but also to regulate the pressure for each set of feeders individually. The length of frontage along which distributing-mains were laid was 9$\frac{1}{4}$ miles. The total length of single cable used throughout the area was 41 miles. Of the feeding-mains there were 10 miles; of distributing-mains 9 miles; of service-lines 1$\frac{1}{4}$ miles—a total of 20$\frac{1}{4}$ miles. The weight of copper in the mains was 210 tons; and the number of joint-boxes, service boxes, and pressure-wire boxes 630. The number of separate service-lines was 275; but many of these served for the supply of several consumers. The battery of accumulators at each station was capable of supplying 500 lamps at a time; thus enabling the machinery to be stopped at from 10 to 12 o'clock at night, and in some cases entirely on Sunday, and also largely in the day time in summer. The discharge from the accumulators was registered by a recording ammeter. By a special arrangement of dividing the accumulators into sections (devised by Mr. Holmes) they were charged from the dynamos supplying the town at the ordinary working pressure; and by a little care it was in this way possible, said the author, to so regulate the load on the engines and dynamos as to run them at their highest efficiency. The number of Board of Trade units used per

lamp per month varied from 6·3 units in January to 1·2 units in June; and in December the output reached 4060 amperes, while in June it did not exceed 500 amperes. A short discussion followed the reading of the paper; and subsequently Mr. Holmes was accorded a vote of thanks.

THE ELECTRIC LIGHTING SCHEME FOR DUBLIN.

At the Meeting of the Dublin Municipal Corporation on Monday of last week—the Right Hon. the LORD MAYOR presiding—the report of the Committee on Electric Lighting was submitted. It recommended the acceptance of the tender of the Electrical Engineering Company of Ireland for £30,714 for buildings and apparatus for public and private lighting.

Mr. ROBINSON, in moving the adoption of the report, explained the different steps which had been taken since April 4, 1887, when he proposed that an expert should be called in to report on the premises at Island Bridge, as to the efficiency of the water power there, and whether it could be utilized for electric lighting. Since then they had obtained a Licence for public and private lighting, and had received tenders for carrying out the necessary works. The Committee, after considering the various tenders, recommended the acceptance of the one sent in by the Electrical Engineering Company, which, though an Irish Company, was an offshoot of the English Brush Corporation, who, he was informed, were prepared to guarantee the efficiency of the installation. The Engineer whom they had consulted (Mr. Manville) said that a station such as the Company were going to erect would cost £37,000. The Committee now asked the Corporation to accept the tender for £29,000; and also to approve of them entering into a contract with the Company to maintain the entire plant for £4000 a year, and 7½ per cent. on the revenue from private lighting. By doing so, the Corporation would benefit nearly to the extent of £2000 a year; besides which the plant would be in the hands of men who were fully conversant with all its intricacies. The High Sheriff had proposed that they should resolve themselves into a Committee of the Whole House. He had no objection to that. This was a matter of urgency; and unless the principal thoroughfares of the city were lighted before Nov. 3 next, their Licence and all their powers under it would expire.

Mr. HEALY seconded the motion, and observed that he was willing that they should resolve themselves into Committee. The financial aspect of the question was, he considered, very important.

Mr. DOHERTY moved as an amendment—"That the Committee resolve itself into a Committee of the Whole House for the purpose of considering the report of the Electric Lighting Committee, and resume at the rising of the Committee."

Alderman PILE seconded the amendment.

Mr. MAYNE remarked that there was a great deal of curiosity amongst the public on this matter; and he thought it would be well that it should be fully discussed in public.

The LORD MAYOR stated that, if the amendment were carried, the matter would be discussed in Committee, and then it should be publicly discussed in the Council.

A division was taken on the amendment, when 22 votes were recorded each way. The Lord Mayor gave his casting vote in its favour; and it was put as a substantive resolution, and subsequently carried. The Committee of the Whole House then proceeded with the discussion of the subject; and on Wednesday and Friday they again met to further consider it.

GASEOUS FUEL AND THE ABATEMENT OF SMOKE.

At a recent Meeting of the Balloon Society, a paper on "Fogs, Snow, and Rain" was read by Mr. R. MACINTYRE, which gave rise to some remarks on the use of gaseous fuel for abating the disagreeable conditions brought about by visitations of fog.

Mr. Macintyre first adverted briefly to the numerous fallacies with reference to what is popularly called "the weather," and gave a general account of the scientific laws which regulate the phenomena of fogs, snow, and rain. He laid particular stress on the importance of a more general knowledge of the scientific aspect of fog, especially with regard to their unwelcome presence in London and other large cities and manufacturing centres, and the necessity for more stringent legislation with regard to the smoke question. He expressed surprise and regret that Parliament had done so little as regards legislation for the purpose of abating the smoke nuisance; and having given a *résumé* of the only Acts which up to the present time have any bearing on the subject, said he ventured to hope that some member of the House of Commons would soon see his way to introduce a measure calculated to minimize the nuisance, and so promote the public health. The first Bill for abating the smoke nuisance was passed in 1853 for the Metropolis only (16 & 17 Vict., cap. 128). By this Act penalties were imposed on persons using any "furnace" which did not consume its own smoke; and it applied also to the steamboats on the river above London Bridge. It was amended in 1856, and extended to factories as well as to the steamboats this side of the Nore. The power to remit the fines weakened the Act. The next Act was passed in 1866 (29 & 30 Vict., cap. 90), and applied to the country generally. By it all chimneys were "nuisances," except those of dwelling-houses; and they were, as far as practicable, to consume their own smoke. Under these conditions, complaints were often dismissed; and this Act of 1866 has been repealed (except as regards the Metropolis) by the Public Health Act, 1875. Thus the Acts of 1853, 1856, and 1866 are still operative for the Metropolis. The provisions of the 1866 Act as to factory furnaces and chimneys were re-enacted *verbatim* by section 91 of the Public Health Act, and are now in force throughout the country.

In the course of the discussion on the paper, Mr. H. G. Assiter (who had read a paper on the subject on a previous occasion) said the theory he favoured in regard to the recurrence of fogs in the Metropolis was that, London really lying in a hollow, fogs which were produced miles away gravitated to the city and enveloped the inhabitants; and there was no doubt they would always be prevalent. If the carbon contained in them could be done away with, fogs would not be so unpleasant as they are. It had been suggested that they could be abated by giving up the open fireplace. He thought, however, it would be a long time before Englishmen would consent to this. An open fireplace was, no doubt, a great means of ventilating an apartment; and they did not want to stop the ventilation. Legislation might be very useful in the matter in teaching people what was really necessary and ought to be done; and all the Acts tending to the improvement of the people should be known to them. He thought they would get rid of a great deal of unpleasantness if the laws existing on the subject were more rigidly enforced. Miss Kelman said she thought the whole matter lay in a nutshell. People should burn gas, and then they would not have any fogs—no black fogs, at any rate. If they burned gas, properly purified, in proper stoves, they would get rid of all unpleasantness. With gas they could see the pure fire so dear to the heart of Englishmen; and at the same time they had not the disagreeable black smoke arising from the use of coals. With regard to the open fireplace, they all liked it; and they could have it. When she spoke on this subject on a previous occasion, a gentleman said it was dreadful to talk about gas-fires in a bedroom; but, as these fires were now regulated, they were the best things that could be used. Gas was really not such an awful thing as was supposed. Its use would do away with an immense amount of the dreadful fog with which Londoners were afflicted. Mr. A. Rogers suggested another way to prevent the nuisance of fogs—viz., to use coke. He said he had coke fires in his own house; and they could cook with a gas-fire as well as with coal, and so do away with all smoke. In replying upon the discussion, Mr. Macintyre remarked that a great deal had been said, from time to time, as to the necessity of inventing new stoves, fireplaces, &c. These would certainly do away with many of the ills to which poor humanity was subject. But London was full of inventions—absolutely overflowing with inventions; the difficulty was to get people to use them. In the great manufacturing centres, the mill-owners and colliery-owners—who produced smoke and allowed it to go vomiting out in volumes—were the people who ought to be looked after. If there were not sufficient laws to meet the requirements of the case, let them have them, and insist upon members of Parliament taking up the question. The following motion was proposed: "That in the opinion of this meeting, so far as concerns the fog and smoke nuisance in the Metropolis, it is desirable that more stringent legislation be enforced, and particularly that the Bill introduced into the House of Lords by Lord Stratheden and Campbell should be revived, and that an Act should be passed strengthening the hands of the local authorities for the more complete abatement of smoke." The President of the Society (Mr. W. H. Le Fevre, C.E.), in putting it, referred to the Acts of Parliament passed to deal with the smoke nuisance, and said there was no doubt that the time had come when something must be done. He was not in favour of too many Acts of Parliament—"grandmotherly" legislation; but he did not know why Acts should not be extended to the question of smoke abatement. The motion was carried unanimously; and the proceedings closed with a vote of thanks to Mr. Macintyre for his paper.

Abolition of Meter-Rents at Wigan.—At the meeting of the Wigan Corporation Gas Committee last Wednesday, the Gas Engineer and Manager (Mr. J. Timmins) presented a report on the subject of gas-meter rents; and after considering it, the Committee decided to abolish all rents from and after the 25th of March next.

The Water Supply of Bombay.—A large reservoir now in progress for supplying Bombay with water will be among the important engineering works of modern times. It will be completed in the course of the spring. A dam which is being formed will be 2 miles long, 118 feet high, and 103 feet wide at the base. A roadway on the top is to be 24 feet wide; and the stone-work will cost £500,000.

New Water Supply for Colwyn Bay.—Steps are being taken to secure for Colwyn Bay a new and copious supply of excellent water from Llyn Cowlyd, situated at an altitude of about 750 feet on a branch of the Snowdonian range of mountains on the Carnarvonshire side of the River Conway. Considerable progress has been made; and the scheme of Mr. T. B. Farrington, Borough Surveyor of Conway, has been accepted—the expenditure involved being £21,000. Mr. T. T. Marks, C.E., the Engineer of the Llandudno Improvement Commissioners, who was engaged to make a report on the scheme, states that the more he examines it, the more certain he is of its success; and it will, when completed, afford the finest water supply in North Wales.

Value of the Oxygen Process with Limited Plant.—At a recent meeting of the Gas and Water Committee of the Ramsgate Corporation, a report was presented by the Engineer (Mr. W. A. Valon, Assoc. M. Inst. C.E.), on the subject of the pressure to which the gas-works have lately been subjected in order to satisfy the consumers' requirements. It appears that in the month of December the make of gas exceeded that in the corresponding month of 1889 by 2,402,000 cubic feet. During the latter part of the month, every available retort was in use; and a double gang was at work to economize time in charging and drawing. The make per mouthpiece averaged 7537 cubic feet in 24 hours. This is the utmost limit of the existing retort-house; and it will be impossible at any future time to more than reach this point. Mr. Valon gave a list of the heaviest outputs within 24 hours during the period mentioned. These ranged from 611,929 to 712,271 cubic feet. On Christmas Eve, when the largest quantity of gas was sent out, there was only a small reserve left in the holders. Fortunately, all the machinery worked perfectly. The condensing apparatus, however, gave considerable anxiety; having stopped as often as twice in 24 hours, owing to its restricted size. The use of oxygen, however, enabled Mr. Valon to purify the gas completely; keeping the sulphur compounds down to a low point, and allowing the staff time to attend to other matters. In the previous year, without oxygen, and using 1¼ per cent. of air, a purifier only lasted four days; recently they have run for four weeks with lime and oxygen, taking out all impurities.

METROPOLIS WATER SUPPLY.

The Quality of the Supply in December.

Messrs. Crookes, Odling, and Tidy, in their report for the past month on the composition and quality of daily samples of the water supplied to London, say: "Of the 133 samples examined, the whole were found to be clear, bright, and well filtered. From the 15th to the 31st of the month, the regular examination of samples drawn from the stand-pipes day by day was largely interfered with by the prevailing frost, which, while considerable also in severity, has not for many years past been equalled in duration; beginning as it did on the 9th, and continuing, practically without intermission, well into the present year. That this wholly exceptional frost, though offering impediments to the process of filtration and retarding the rate of filtration, did not interfere with its thoroughness, is shown by the circumstance that no one sample of water was found otherwise than free from colour and turbidity. Moreover, in respect to chemical characters generally, the water supply for December was found to compare favourably even with the supply of the previous summer and autumn months. It came to our notice, however, that some of the Thames-derived water distributed during the later part of December, and at the commencement of the present year, manifested, in the case of certain particular samples, an unpleasant faint taste, associated in yet fewer instances with a corresponding odour. From our analysis of different samples, we were able to satisfy ourselves definitely that the occurrence of this taste and smell—both evanescent—did not depend on any contamination of the water with animal matter; and from a consideration of the exceptional meteorological conditions prevailing of combined frost, fog, and snow, and from our examination of various samples of snow and snow water, we are inclined to attribute the occurrence in question to an admixture with the main supply of a small proportion of water furnished by the melting of heavily fog-laden snow, such as some of that on which we had the opportunity of experimenting."

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 181,980,410 gallons, as compared with 163,651,490 gallons in the corresponding month of 1889; being at the rate of 30·3 gallons per head of the population, as against 27·7 gallons in December last year. Of the entire bulk of water sent out, 88,928,583 gallons were drawn from the Thames, and 93,051,827 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·6; New River, 1·2; Tottenham, 1·3; Colne Valley, 1·5; Southwark, 2·4; East London, 3·0; Lambeth, 3·1; Chelsea, 3·2; Grand Junction, 3·3; and West Middlesex, 3·4. The water abstracted from the Thames by the Chelsea, West Middlesex, and Grand Junction Companies was inferior in quality to that delivered by the same Companies in November. The standpipes of the Southwark Company, where the samples are usually collected, were frozen on the 12th, and the sample was not collected until the 27th, when it was of much better quality than the other samples of Thames water. All the waters were efficiently filtered before delivery. Of the water taken chiefly from the River Lea, that delivered by the New River Company was of a high degree of chemical purity, and compared favourably in this respect with the deep-well waters. The water delivered by the East London Company was inferior to that supplied last month. Both waters were efficiently filtered. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of excellent quality for dietetic use. These waters were clear and bright without filtration. The Colne Valley Company's supply was softened before delivery, and thus rendered suitable for washing. The river waters were all delivered at a temperature not far removed from the freezing point; while the deep-well water of the Kent Company maintained nearly its summer temperature."

LIVERPOOL CORPORATION WATER SUPPLY.

Bursting of a Large Water-Main.

Early last Tuesday morning, a serious accident occurred to a water-main connected with the filter-beds which have been built, by the Liverpool Corporation, upon the hills to the north west of Oswestry. The water from Lake Vyrnwy at Llanwyddyn is conveyed by pipes and tunnels to Llanforda, near Oswestry; and here a supplementary artificial lake, containing 46 million gallons of water has been constructed in a depression in the hill. The distance from Llanwyddyn is about 18 miles. Below, about three-quarters of a mile, near Oswestry, on a plateau, a series of elaborate filter-beds have been constructed. The water passes through these, and then into what is known as the clear-water reservoir, before being despatched through the valve-house to Liverpool. The disaster which occurred on Tuesday morning took place in the few yards of main connecting the last filter-bed with the clear-water reservoir; and there is no doubt the water was running for over two hours. As soon as the accident was discovered, the water was turned off. The burst appears to have been a sudden one, and tons of the earth in which the main was embedded were displaced. Owing to the great pressure of the water in the reservoir, amounting to about 40 million gallons at the time, considerable force was given to the torrent of escaping water. Some indication of the extent and power of the flood are afforded by its having torn up and carried with it tons of stone, while hurdles are reported to have been deposited upon the branches of trees. Fortunately, the greatest violence of the inundation was expended upon a road destitute of houses; and consequently there was very little damage done to property. The flooding of a tannery, resulting in injury to about 1500 hides, and the demolition of the roadway, appear to be the most serious items in the damage. The chief danger to be apprehended from such an occurrence was that the gas-works of the town might be incapacitated. Happily, however, although the lower portion of the works were submerged, the danger of the retort-house being affected by the flood was averted. The damage done to public and private property is roughly estimated at £2000. The masonry lining of the clear water reservoir appears to have stood the strain well, notwithstanding that the earthen embankment was partly washed away. The retaining wall is 7 feet thick at the base, tapering to 3 feet. The local correspondent of a Liverpool contemporary states that an outer flank of the embankment of the tank has been considerably damaged by the rush of water over it; the fact being obvious upon the most cursory examination. The safety of the embankment has not, however, been at all endangered. The Resident Engineer of the Liverpool Corporation, it is stated, has promptly admitted their liability to pay compensation for damage done by the flood in Oswestry; and he has requested the borough authorities to repair the mischief as quickly as possible, and to send in their claim to the Corporation.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

I am sorry that I have still to chronicle the existence of the railway strike, which to-day completes its fifth week. It was thought yesterday that a successful attempt at a settlement had been made by the Earl of Aberdeen. But his Lordship failed to obtain the consent of the Manager of the Caledonian Railway Company; and his well-meant endeavour to attain an amicable settlement was abortive. The fact is that the Caledonian Company, whose administration is the best in Scotland—being founded on the lines of the London and North-Western, which is the premier Railway Company of the world—is in a position to defy the strikers. Owing to the better arrangement of their traffic, their men were not nearly so hard-worked as those on the North British system; and had it not been for the long hours and hardships on the latter railway, there would have been no strike. Therein consists one of the evils of the new organization of trades, in respect that the Caledonian Company are punished because of the delinquencies of their neighbour. The position of the Caledonian at this juncture, however, proves to be the strength of the Companies' cause, because when they are able to run nearly all their trains, the public are served in a way, and there is less occasion for public outcry. Before leaving the general question, I would like to point out that, notwithstanding what is said by many on behalf of the men, to the effect that they have the sympathy of almost the entire community with them, the very reverse is the case. This is shown by the fact that, if subscriptions to the strike fund from trade organizations are excluded, the public have only subscribed £300 to an Edinburgh Citizens' Committee who have been collecting subscriptions; while a Committee which has been working on the other side, to collect subscriptions for the men who have remained loyal, have succeeded in raising £800. I learn to-night that the North British have taken a strong step, which will be watched with interest, in raising an action for £20,000 against the leaders of the men, as damages for the loss occasioned by the strike. Whatever may be the issue of any such action—and it will be fought bitterly—the significant part of it is that the Company have arrested the money in the hands of the leaders, which means that unless these men are able to raise funds speedily, the strikers will not receive their weekly allowances. The effect of this may be easily surmised.

So far as the service of gas undertakings is concerned, this week has shown a decided improvement. The Edinburgh works have regularly received supplies of coal, and now have a small stock in hand. In this connection, it may be mentioned that a member of the Gas Commission has brought upon himself no little indignation by his action in siding with the strikers, and endeavouring to bring pressure upon Mr. Mitchell to withdraw his men from working an engine upon the North British lines in the carriage of coal into the works. Whatever may be the merits of a question as to the legality or the propriety of men in the pay of the Commissioners working on a railway system, to the general detriment of the strikers, there can be but one opinion that it was in the interest of the public that coal should be fetched to the works; and Mr. Mitchell is to be commended for adopting the expedient, when the Railway Company could not run their trains, of sending out his own men for a supply. It is a grave question, however, whether the Gas Commissioner in his action did not violate the obligation he came under when he took office, to be loyal to the interests of the Commission. This is a matter which the Commissioners may have to deal with; and I hear that something of a stormy nature may be said of this and other subjects at the meeting of the Commission on Monday. The Burntisland Gas-Works have made the narrowest shave of any in the matter of the coal supply. On Wednesday the store was all but empty; and the town would that night have been in darkness but for the generosity of a shipping agent, who, on learning the position of the Gas Commissioners, very kindly let them have a waggon of coal which was intended for exportation. The works are fired on the old system; and on the same day there was only one ton of coal left for the furnaces. The town being quite near to coalfields, since the strike began coal has been carted from the pits to the works; but in the early part of the week the roads were in a very heavy condition, and the carters withdrew rather than inflict injury upon their horses. The charge was made that the Burntisland Oil Company were intercepting coal which should have gone to the gas-works. This was denied by the officials of the Oil Company; but the latest information I have seems to point to the accuracy of the charge. This incident is one of the best commentaries upon the straits to which public works have been reduced. In Arbroath there were sufficiently regular supplies of coal to keep going; and it is not now anticipated that there will be any difficulty in retaining a stock.

An exhibition of fickleness such as almost makes one blush has just been made by Mr. Councillor Macnaughton, of Edinburgh. Mr. Macnaughton is a young man whose opinion of himself is not less than that which anybody else holds. He is a Gas Commissioner; and because he did not get the Works Committee of the Commission at their last meeting to look at a question, and by no means an important question,

as he liked, he sent in his resignation as a Commissioner. His letter of resignation stated that "after what took place at the meeting of the Works Committee, he had to resign his seat. He had asked the Committee to delay consideration of a report on the checking of meters, on the ground that he had not had an opportunity of fully considering it; but on the motion of Bailie Archibald, the remit was discharged, and that notwithstanding an appeal by the Convener (Bailie Steel) who, along with himself, were the only Edinburgh representatives who were present at the meeting." With all due deference to Mr. Macnaughton, it surely is not necessary that every member of a Committee should be fully acquainted with the details of every trifling question which may arise. If this were to become a practice of the Commissioners, how would they ever be able to transact their business? It was open for him to move the rejection of the minute of the Committee when it came before the Commissioners; but his honour appeared to be hurt at not being allowed to "boss" the Committee, and in a fit of spleen he resigned. There was a talk at the Town Council meeting of re-electing him; and if this should be done, he ought to go back with the desire to work along with others, and not to take up the attitude that no one on the Commission can transact business except himself.

It appears that, although Mr. Henderson has been unseated in the Edinburgh Town Council, he will be allowed to retain his seat on the Gas Commission. The Town Council are not required to elect their representatives on the Gas Commission from their own number; and as Mr. Henderson has been elected to the Commission, he will hold his appointment, unless he chooses to resign, which it is improbable he will, for three years. There is thus a possibility that Mr. Colston, who takes his seat in the Town Council, may not obtain a seat on the Gas Commission, which is to be regretted. There are, however, other two vacancies on the Commission to fill up, owing to the resignation of Treasurer Clapperton and Mr. Hay, who are retiring in connection with a general scheme of reconstruction of Committees, and he may be appointed to one of them.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

On three separate days of this week, Mr. A. F. Phillips, Gas Engineer, of London, spent some time in the works and offices of the Partick, Hillhead, and Maryhill Gas Company, making a very careful examination of the works, books, &c., with the view of enabling him to co-operate with Mr. George Livesey in preparing a valuation of the same for the Glasgow Corporation Gas Committee, in their forthcoming negotiations with the Gas Company's Directors for the proposed acquisition of the whole undertaking. I may here mention that Mr. Livesey and Mr. Foulis have also made an inspection of the works, within the past few days, for the same purpose. It is further worthy of mention that the Company's shareholders have had two private meetings lately, at which they have, by formal resolution, agreed to support the Directors in their application for parliamentary powers for their undertaking. They have also left the sale and purchase negotiations entirely in the hands of the Directors. It seems that certain clauses are contained in the Company's Bill which are considered likely to have some effect on the interests of the Gas Trust; and accordingly a Special Sub-Committee has been appointed to take charge, on behalf of the Trust, of the opposition that is to be given to the measure by the Corporation. One of the members of the Sub-Committee is Mr. Angus Campbell, a very clever lawyer.

Apropos of the actions of suspension and interdict raised in the Court of Session at the instance of the Partick, Hillhead, and Maryhill Gas Company against the Glasgow Corporation Gas Commissioners and Mr. and Mrs. Bruce, regarding the laying of gas-pipes at, and supplying Corporation gas to, properties in Belmount Street and Lacrosse Terrace, Hillhead, and which were both refused last month by the Lord Ordinary, I may mention that the Directors of the Gas Company have reclaimed against the judgment to the Inner House of the Court. The Corporation Gas Committee have consequently resolved that no action be taken by the Corporation for completing the connection between their main and the service pipes supplying the Lacrosse Terrace properties.

There has been much writing in the local papers, together with a vast amount of talk and speculation, during the past week regarding the disaster at the Dawsholm Gas-Works. In one paper it has been seriously stated to-day that the loss to the Gas Trust in respect of the two holders will be about £22,000, over and above which there is the loss of the gas that was contained in them. This the writer estimates at the enormous amount of £30,000; against which may be put the fact that the actual loss to the Trust on account of the gas that was burnt or dissipated was not more than about £150. Then, again, I am informed by an expert in such matters that he will be very much surprised if the cost of putting the holders again into working condition should eventually exceed £5000. He also says that the repairing and reconstructional work can be completed in a couple of months; whereas the writer with whose remarks I am dealing, says "it is not expected that the gasometers can be renewed earlier than the beginning of next winter."

The Glasgow Corporation expenses connected with the Boundaries Inquiry Commission and the Parliamentary Bills which followed thereupon, together with the several Bills of Session 1890, amounted to £12,096 18s. 11d., of which the Gas Commissioners have been called upon to pay a total of £3465. The Finance Sub-Committee considered that the allocation had been improperly made, so far as the Gas Trust was concerned; and accordingly they instructed the Treasurer to send back the accounts to the City Chamberlain for reconsideration by the Representative Committee for the various Corporation trusts.

At their monthly meeting held last Tuesday, the Greenock Police Commissioners had under consideration the minutes of the Gas Committee; and in the course of his remarks when moving their adoption, Mr. Bell stated that the Sub-Committee to whom had been remitted the question of the new holder which it was proposed to erect at Inchgreen Gas-Works, had drawn up a report. This report would be submitted in the course of the week to a special meeting of the Gas Committee; and he stated that if it was agreed to, he would ask that a special meeting of the Police Board should be called for an early day in the ensuing month.

The Glasgow pig iron warrant market has been very idle during the past week, and the prices of Scotch warrants have only fluctuated between 47s. 9½d. and 47s. 0½d. per ton; while the closing price yesterday afternoon was 47s. 1d. per ton cash buyers. Neither has there been any great amount of fluctuation in the prices of Cleveland or hematite iron warrants. There is really nothing new to report in regard to the position of the market. Outside speculation is almost completely absent; and in general business, consumers do not as yet show much inclination to buy.

Notwithstanding the allegations on the part of the railway companies that their mineral traffic is fast resuming its normal condition, the prices of coal still remain abnormally high; but the fact may to some extent be due to the grasping disposition of the coal merchants, rather than to the prices charged by the colliery proprietors. Coal for gas-making purposes is still difficult to get in very many places.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan. 24.*

Sulphate of Ammonia.—There is a decidedly firmer tendency, and a good business has been done, principally at £10 12s. 6d. and £10 13s. 9d., f.o.b. Hull and Liverpool, for January-February delivery; and £10 15s. is now asked for near parcels. The bulk of the orders have come from France and Spain, and some from America; and it is anticipated that, as soon as the navigation is quite free again, a good demand will set in from Germany as well. Consumers are meanwhile looking askance at nitrate, the future of which with so many opposing influences is very uncertain; and although some advance has been established this week, it is doubted whether it can be maintained in view of heavy arrivals and large stocks.

LONDON, *Jan. 24.*

Tar Products.—The closing of foreign ports, and the very intense weather at home, has made great havoc with business in this market. Tar distillers' tanks are overflowing with common oils; and there are immense accumulations of pitch. This untoward position has somewhat affected market values; and with the exception of benzol, all other tar products are more or less quoted lower. Benzol is very firm, and the supply short; but whether this arises from the higher heats at which gas managers are carbonizing and the application of the Dinsmore process—either *per se* or in modified form—or whether the demand has overtaken the supply, or whether it is a combination of all these causes, it is difficult to say. The fact remains that at the season of the year when most is produced, and carbonizers are at full work, users of benzol are short of stock, and anxious to buy. Business is marked to-day: Tar, 30s. Pitch, London, 36s.; country, 34s. Benzol, 90 per cent., 4s. 8d.; 50 per cent., 3s. 6d. Toluol, 2s. Solvent naphtha, 1s. 9d. Crude naphtha, 1s. 8d. Creosote, 2¾d. Heavy oil, 2¼d. Crude carbolic, 60's, 1s. 6d. Cresol, 9d. Anthracene, "A" quality (30 per cent.), 1s. 3½d.; "B" quality, 1s.

Sulphate of Ammonia.—A little more life characterizes this market, although shipments have been prevented by the weather, and stocks are therefore much bigger. Buyers are anxious to fix forward business; but prices continue wretchedly low, and makers would do well not to be caught selling forward at what it is thought is the bottom price. Sulphate is almost certain to improve with the advance of spring; and manufacturers should merely sell from hand to mouth in the meantime. Business is reported at from £10 5s. to £10 12s. 6d., according to delivery and conditions. Ammoniacal liquor is weak, and quoted (having regard to strength and position) from 5s. to 7s.

The Accident at the Loughborough Gas-Works.—In the JOURNAL last week reference was made to an extraordinary occurrence at the Loughborough Gas-Works on the previous Friday night, by which the town was suddenly deprived of light. The cause was an overflow of ammoniacal liquor into the gas outlet main. It appears that it is the custom to convey the tar and liquor away by boats—a pipe connecting the pumps with the canal. Owing to the long-continued frosts, the boats were ice-bound; and for more than a month, the Engineer (Mr. J. Bramley Ball, Assoc. M. Inst. C.E.) has been unable to send any of the liquor away. At the time of the occurrence, he had between 40,000 and 50,000 gallons stored; and unfortunately some of it overflowed into the main. Mr. Ball was promptly upon the scene; and under his direction, the mains were cleared in a couple of hours. Seeing, however, that probably many gas-jets would have been left burning, he very wisely decided not to turn on the supply till ten o'clock the next morning, consequently the town was left in darkness until break of day.

The Liberty and Property Defence League have issued their parliamentary report for the past year, giving a list of some of the more important Bills which engaged the attention of the Parliamentary Committee during the session of 1890. The motto of the League being "Self Help *v.* State Help," they opposed all measures contravening the principle of freedom of contract, or manifesting a socialistic tendency; and in a great number of instances, their efforts were successful. Reference has already been made in our columns to the vigorous action of the League in opposition to the attempt of the Brighton Corporation to raise £30,000 for lighting a small portion of the town when a private company was in the field and prepared to undertake the work; and although the Local Government Board sanctioned the loan, the application, thanks to the attention called to it by the League, was severely criticized by the ratepayers. The Borough Funds Bill, the object of which was to enable municipalities, in contravention of the Borough Funds Act, 1872, to employ the ratepayers' money, without their consent, in opposing Bills in Parliament, was also opposed by the League; but it was withdrawn before the second reading. The Metropolis Water Bill was likewise objected to, because it sought to deprive private Water Companies of rights granted to them by the State; but this measure, like the one just referred to, did not reach a second reading.

Proposed Acquisition of the Norwich Water-Works by the Corporation.—At the meeting of the Norwich Corporation last Tuesday, a Committee was appointed for the purpose of taking steps to ascertain the proper value of the Water Company's undertaking, with a view to making an offer for it.

Lancashire Coal Trade.—There is an active demand for general descriptions of coal; but there is still a difficulty in supplying orders—most collieries being behindhand owing to the block in the traffic consequent upon the late frost. Quotations at the pit's mouth are: Best house coal, 12s. to 12s. 6d. per ton; seconds, 10s. 6d. to 11s.; common round coal, 9s. to 9s. 6d.; burgy, 7s. 6d. to 8s.; best slack, 6s. 9d. to 7s. 3d.; and inferior sorts, 5s. to 5s. 9d. per ton.

The Recent Stoppage of the Gas Supply at Ipswich.—In regard to the partial stoppage of the gas supply at Ipswich on Christmas morning, referred to in the JOURNAL for the 30th ult., a letter from the Engineer of the Gas Company, Mr. J. T. Jolliffe, was read at the meeting of the Ipswich Paving and Lighting Committee last Friday, explaining that it was caused by an error of judgment on the part of the foreman in charge of the works; and measures had been taken which, it was hoped, would render such a mishap impossible in the future.

The Bowman Oxygen Lighting Company have notified their intention of not proceeding any further in the present session with the Bill deposited by them for power to generate and supply oxygen for public and private lighting purposes within an area comprising the City of London and the whole of the Metropolis as defined by the Metropolis Management Act, 1855. The Bill, it may be remembered, also proposed to authorize the Company to open any streets within this area, and to lay mains; while power to enter into agreements with the Gas Companies was also required, for the supply of oxygen by the Company for increasing the illuminating power of gas.

The Selby Local Board and the Purchase of the Gas-Works.—At the meeting of the Selby Local Board last Thursday, a letter was read from the Local Government Board with regard to the Board's application for a Provisional Order, in which they inquired if the Board had in contemplation the construction of new works; and if they did not propose to do so, why a parliamentary deposit had been made. The Clerk explained that this had been done by mistake. He also pointed out that the Local Government Board desired to have some of the clauses of the Order rearranged; and that an affidavit would be required to the effect that the Board did not wish to erect new gas-works. It was decided that an affidavit should be sent to the Local Government Board.

Northern Coal Trade.—The coal trade of the North has been more animated during the past few days. Northumbrian steam coal has been strong, and commands from 11s. 9d. to 12s. per ton free on board; while small coal has advanced to 4s. 6d., owing to the inquiry for it for some of the Scotch ports. For gas coal, the demand is still very large; and it commands about 11s. per ton. The climatic influences have greatly increased the consumption of gas; so that the inquiry for gas coal is much above what is usual at this time of year. In some of the local towns, the growing use of gas-stoves is beginning to tell, as it causes a very appreciable day consumption. Blast-furnace coke is steady at £1 per ton free on board. There is no alteration in the price of gas coke; but the output is very large just now.

Colne Valley Water Company.—In the report to be presented at the half-yearly general meeting of this Company to be held on the 12th prox., the Directors state that in the six months ending Dec. 31 last a sum of £7206 was spent on capital account, the greater part of which was for a new engine and boilers. The total expenditure on this account up to date was £198,993 18s. 1d., out of the £200,265 paid up. The net profits on revenue account were £3129; being rather in excess of those for the corresponding half of 1889, notwithstanding a considerable increase in the cost of coals. There is a balance of £1898 11s. 4d. on the dividend and interest account, after paying the usual 4 per cent. interest on the debenture stock and preference shares, and transferring £100 to the reserve account; and out of this balance the Directors propose to pay a dividend at the rate of 3 per cent. per annum—leaving £130 to be carried forward.

The Heating and Ventilation of the Aberdeen Public Library.—The Improvements Committee of the Aberdeen Town Council lately had before them a report from Mr. A. Brown, Architect, in the course of which he said that, having recently inspected the system of heating and ventilation at the new Victoria Infirmary in Glasgow, with the view of introducing it at Ross's Public School in Aberdeen, he was of opinion that it was well worth the consideration of the Library Building Committee of the Council, and that the Committee and the public would have every reason to be satisfied with its introduction in the new building. He was so satisfied of the superior results to be obtained by this method over all others, that he suggested the appointment of one or two members of the Committee to visit the Victoria Infirmary, when the cost of the installation could be obtained. The system referred to, our readers may remember, was devised by Mr. W. Key, Engineer of the Tradeston Gas-Works of the Glasgow Corporation. The matter was referred to a Sub-Committee.

Private Bill Legislation.—In our editorial columns reference is made to the debate in the House of Commons last Thursday on the motion for the second reading of the Private Bill Procedure (Scotland) Bill. On that occasion, Mr. Campbell-Bannerman brought forward an amendment to the effect that the subjects dealt with in Private Bill Legislation ought not to be remitted for inquiry to a Commission, as proposed by the Bill, until it had been shown to be impracticable to remedy the evils now complained of by amending the present system of inquiry by Parliament, and by extending the powers of municipal authorities in counties and burghs. His proposition was, however, rejected; and the Bill was committed. He nevertheless intends to pursue the subject; and has accordingly given notice of his intention to move—"That it be an instruction to the Select Committee on the Private Bill Procedure (Scotland) Bill that it has power to inquire into the expediency of referring Private Bills to a Joint Committee of both Houses; into the scale of fees charged for the different stages of such Bills; and into the expediency of extending in some way the powers of local authorities in promoting schemes of public utility."

The Deacon Meter.—The Indian Government have decided to establish the Deacon waste-water meter system in Delhi; and we learn that at home a large development of the system is about taking place in Bristol.

C. E. Gittins, Limited.—A Company under this title has just been registered with a capital of £5000, in £5 shares, to acquire certain letters patent granted to Charles E. Gittins for filters and water softening and purification, and the trade marks connected therewith.

Leigh and District Water Supply.—With respect to the Order which is being applied for by the South-East Essex Water Company, a further Vestry meeting was held at Leigh last Thursday, when Mr. Pope, on behalf of the promoting Company, said it was anticipated that in the future extensive building operations would be going on in the Leigh district, and for this reason the Company was formed. They would be bound to commence operations within a year of obtaining their Order; and to complete the works in three years. If in six years they did not give a sufficient supply, another company could be formed. A resolution was carried in favour of the draft scheme, on the understanding that no compulsory rate should be leviable. A similar resolution has been passed at Rayleigh.

The Management of the Dundee Corporation Water-Works.—A special meeting of the Dundee Water Commissioners was held last Wednesday, at which the resignation of the position of Water Engineer and Manager by Mr. J. Watson, who, as already announced in the JOURNAL, has been appointed Water Engineer to the Corporation of Bradford, was read. In accepting the resignation, the Commissioners resolved to enter upon their minutes their sense of the great services Mr. Watson had rendered. Several members spoke to his admirable business qualities; special reference being made to the ability and energy he displayed after the fall of the Tay Bridge, but for which the inhabitants of the town would have been in a deplorable condition for want of water. At the same meeting Bailie M'Culloch resigned his office of Water Commissioner, and also that of Convener of the Works Committee of the Commissioners, in order to qualify himself for the post of Engineer. Mr. Brownlee was appointed Convener. A Committee was appointed to consider and report as to the duties and emoluments of the new Engineer.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 150.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c	10	12—13	..	5 15 6
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	16—18	..	8 17 10
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5—5⅝	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	,,	,,	9½	Do. New	100	155—160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	28 Mar.	11½	British	20	43—45	..	5 0 0
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14	..	5 14 3
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	11—12	..	5 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101—104	..	5 15 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	26—28	..	5 14 3
550,000	Stck.	10 Oct.	13⅜	Commercial, Old Stock	100	250—254	..	5 8 3
130,000	,,	,,	10⅜	Do. New do.	100	198—203	..	5 5 11
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	30 Dec.	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	32½—33½	..	5 8 5
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37—39	..	5 2 6
75,000	Stck.	25 Sept.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	16 July	—	European, Limited	10	19—20	..	—
120,000	10	,,	—	Do. New	10	19—20	..	—
354,060	10	,,	—	Do. do.	7½	13½—14½	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	245—250	−2	5 4 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	251—256	..	3 18 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 2 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	164—168	..	4 3 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
176,000	,,	—	—	Do. K, 6 p. c. Prf.	100	150—155	..	3 17 5
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—118	+2	3 7 10
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—126	+½	3 11 5
650,000	,,	,,	6	Do. 6 p. c. do.	100	162—166	..	3 12 3
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	225—230	−1½	5 4 4
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—113	..	4 8 6
541,920	20	27 Nov.	8¾	Monte Video, Limited	20	18¼—19¼	..	6 13 4
150,000	5	27 Nov	10	Oriental, Limited	5	8¾—9¼	..	5 8 1
60,000	5	25 Sept.	7	Ottoman, Limited	5	5—5⅛	..	6 7 3
166,870	10	16 July	4	Pará Limited	10	3—4	..	10 0 0
420,000	100	3 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	95—100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93—98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	15—17	..	5 17 8
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	282—287	..	4 12 4
1,350,000	,,	,,	11½	Do. B do.	100	230—235	..	4 17 10
141,500	,,	,,	2	Do. C do.	100	235—245	..	4 17 11
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140—145	..	3 9 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	267—272	..	3 13 6
1,720,560	Stck.	10 Oct.	7½	East London, Ordinary	100	215—220	..	3 8 2
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	120—125	..	3 12 0
708,000	Stck.	14 Aug.	10½	Kent	100	274—279	..	3 15 3
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	248—253	..	3 15 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	195—200	..	3 15 0
260,000	Stck.	25 Sept.	4	Do. 4 p. c. Deb. Stk.	100	130—134	..	3 4 6
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 8
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	175—180	..	3 17 9
126,500	100	,,	7	Do. 7½ p. c. do.	100	167—172	..	4 1 4
1,155,066	Stck	12 Dec.	10	West Middlesex	100	263—268	..	3 14 7

Opposition to the Malvern Water Bill.—Yesterday week a meeting of owners and occupiers of property in districts which will be affected by the Malvern Water Bill was held. Mr. G. W. Hastings, M.P., presided, and said that, as a large owner of property in the district, he had felt it his duty to oppose the Bill. The Local Board could not be allowed to acquire a public right at the expense of private rights. He was surprised that the Board had not amended their Bill before presenting it to the House of Commons. The scheme provided for the erection of an embankment 86 feet high, which would be a source of danger, and about which the County Council might have something to say. The meeting passed a resolution agreeing to oppose the Bill, and appointed a Committee to take the necessary steps.

Filey Gas and Water Company.—A special meeting of this Company was held last Friday week, to consider the Bill now being promoted in Parliament to confer further powers upon the Company in relation to the supply of gas and water; to extend the limits for the supply of water; to authorize the raising of additional capital; and for other purposes. The Chairman, Captain Unett, in moving that the Bill be approved, said that the outlook of the Company was exceedingly satisfactory; and he did not think that they ought to have any difficulty in raising the additional capital required, because they found, on carefully going through the accounts, that they would be able to pay a dividend of quite 5 per cent. with the £2000 extra capital which they proposed to borrow. The motion was agreed to.

The Supply of Water for Fire Extinction in the Metropolis.—According to the report just presented by Captain Shaw to the London County Council on the fires which occurred in the Metropolis during the past year, the quantity of water used for extinction purposes was between 20 and 21 million gallons, or about 92,000 tons. Of this, 8 million gallons—about 40 per cent. of the whole—were taken from the river, canals, and docks, and the remainder from the street pipes. During the year there were six cases of short supply, four of late attendance of turncocks, and eight of no attendance; making altogether eighteen cases in which the water arrangements were unsatisfactory. Captain Shaw points out that, whenever the supply is intermittent, difficulty must occasionally arise; and he says the only remedy is to make the service constant. During the past year no loss of any serious importance arose through defects in the water arrangements; and he freely acknowledges that the Water Companies appeared to do everything in their power to meet the requirements of the Fire Brigade.

The Folkestone Corporation and the Public Lighting.—At a meeting of the Lighting Committee of the Folkestone Town Council last Friday, a discussion arose on the opinion received from Sir Horace Davey with regard to the Corporation's power to regulate the charges of the Folkestone Gas Company for gas supplied to the public lamps, to which reference was made in the JOURNAL on the 16th ult. Sir Horace expressed the opinion that the Corporation have no power to call upon the Company to charge for gas supplied to the Corporation for public uses 10 per cent. less than the price charged to private persons; but he recommended that, in the event of the parties being unable to come to terms, the question should be submitted to an arbitrator for settlement. Ultimately the Committee decided to recommend the Corporation to refer the matter back to Sir Horace Davey on the question of the price to be charged and paid. On the Committee's report being submitted to the Town Council, Mr. Thompson moved that instructions be given to them to settle the differences by arbitration, either by mutual agreement or under the terms of the Act of 1871. Mr. Payer seconded the motion; and it was carried.

Fatal Explosion of Natural Gas.—On the afternoon of the 18th inst., a terrific explosion of natural gas took place at Findlay (Ohio), by which the Hotel Marvin was blown up, and several persons were killed and injured. It is reported that the disaster was caused by two plumbers, who had been called in to repair a leaky gas-pipe under the dining-room. They had cut a hole in the floor, when a waitress standing by lighted a match. It ignited the gas, and there was an immediate explosion. The waitress was killed on the spot, and the two plumbers were fatally hurt; one of them subsequently dying. Another waitress was killed by the falling timbers; and a third was taken out and died on the way to the hospital. Mr. Anderson Marvin, the chief proprietor of the hotel, was seriously hurt; and his partner lost an eye. The Hotel Marvin was the finest in the city; and it will cost $35,000 to repair the damage done.

Failure of the Electric Light at a Banquet.—That bad habit of the electric light, of collapsing on conspicuous occasions, has again been illustrated. This time the scene of failure was at the Assembly Rooms, Newcastle, when the Liberals of the North were banqueting together in honour of Mr. James Joicey, M.P., on Wednesday, the 14th inst. The rooms are lighted entirely from magnificent electroliers; and, on the evening in question, everything went well until "the sweets" course was reached, when suddenly, without any warning, the light failed, and the place was left in total darkness. The services of a number of humble candles were requisitioned; and by the dim light emitted by them, the proceedings were continued. Subsequently, during the speech of the Chairman (the Right Hon. John Morley, M.P.) the light again came on; and, it is reported, "loud and prolonged cheering" followed. But before the Chairman could proceed farther, it as suddenly went out again; which led the right hon. gentleman to remark, amid much laughter, that he was glad to think the political constancy in Newcastle was more to be relied upon than the constancy of the forces of Nature. The Secretary of the Electric Light Company has since stated that the accident was due to a safety fuse in the building having given out, and that the other lights on the Company's system were not affected in any way.

The Commercial Gas Company and the Troubles at the Docks.—The following paragraph appears in the last issue of the *Sunday Times*: The boycotted steamer *Eastern Star* is still lying in the Regent's Canal basin; and Mr. Gardner, the contractor for discharging the ship for the Commercial Gas Company, stated yesterday [Saturday] afternoon that his men, who since the arrival of the *Eastern Star* on the 14th inst. have discharged several other vessels, absolutely refuse to touch the cargo of this one. The vessel is not a regular collier; and the owner, Mr. Thomson, of Newcastle, has no other use for her at present—so many ships being already laid up in the Tyne. The captain states that the Union crew which he was forced to discharge last voyage, was one of the best he ever had; but after waiting in port for three days, he was compelled to ship a scratch crew of "freemen," not one of whom was able to steer. Consequently neither he nor the chief officer was able to leave the bridge on the passage between the north and London. At present it is impossible either to discharge or move the vessel, as no crew can be obtained in place of the men who were paid off immediately on their arrival in London. Mr. Gardner further states that should the Shipping Federation decide to place men on board to discharge the cargo, he has plenty of barges to take it in; but as the Commercial Gas Company's *employés* belong to the Gas Workers' Union, it is probable that they would refuse to place the coal in the retorts. Thus matters are entirely at a standstill with regard to this ship.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

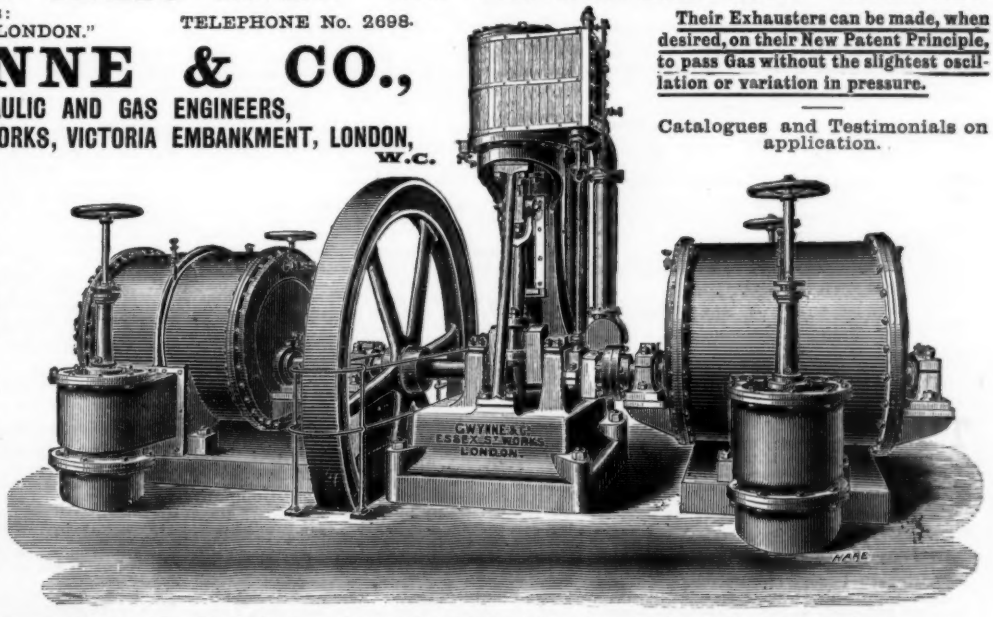
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.

Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

SADLER AND CO., LIMITED,

MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.

Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, by an experienced Man, a Situation as SALESMAN or TRAVELLER, fully conversant with Gas Lighting and Heating and Cooking Appliances. Good experience in conducting Gas Exhibitions. Excellent references.

Address E. C., 21, Offerton Road, CLAPHAM, S.W.

WANTED, a Working Manager and Fitter for a Gas-Works in the Midland Counties. Must have a thorough knowledge of Carbonizing and Purification. Salary, £100 per annum, with House Coal, and Gas.

Address, stating age, qualifications, and references, No. 1899, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BANDON TOWN COMMISSIONERS (CO. CORK).

MANAGER FOR THE GAS-WORKS.

WANTED, a Competent Person for the above position. Salary, £80 a year, with House, Fuel, and Light, also Garden.

Applications, with copies of testimonials, to be lodged with the undersigned at or before Ten o'clock a.m. on Monday, Feb. 2, 1891.

By order,
JOHN M'DONNELL, Town Clerk.

Board-Room, Bandon,
Jan. 15, 1891.

SHEFFIELD UNITED GASLIGHT COMPANY.

WORKS SUPERINTENDENT.

WANTED, by the Directors of this Company, an experienced and competent Man to act as SUPERINTENDENT at their Effingham Street Gas-Works. (The position is vacant owing to the present Superintendent having been promoted.) He will be required to reside on the Works, with House, Coal, and Gas free.

The maximum make of Gas at this Station is about 3½ million cubic feet per day.

Applications (marked "Superintendent"), stating age, previous engagements, and salary required, to be made by letter only, addressed to Sir Fredk. T. Mappin, Bart., M.P., Chairman of the Company, Gas Offices, Sheffield, not later than Friday, Feb. 6, 1891. Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 15, 1891.

THE Sheffield United Gaslight Company require the services of an efficient DRAUGHTSMAN. One who has been connected with Gas-Works preferred.

Salary £120 per annum.

Applications (marked "Draughtsman"), stating age, previous experience, &c., to be sent to the undersigned not later han Friday, Feb. 6, 1891.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 15, 1891.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

ENGINEER.

THE Gas Committee are prepared to receive APPLICATIONS from Persons qualified to fulfil the duties of GAS ENGINEER and MANAGER to this Department, and competent to design and superintend the carrying out of Extensions required from time to time.

The Engineer appointed will receive the assistance of an under Engineer.

Salary £400 per annum.

Applicants must possess a sound and practical knowledge of Gas Manufacture and Distribution, and also of the treatment of Residual Products.

Applications, stating age, present position, experience, with full particulars of past engagements, together with copies of testimonials, to be addressed to the Chairman of the Gas Committee, Gas Office, Stockport, endorsed "Engineer," on or before Twelve o'clock Noon on Monday, Feb. 2, 1891.

By order,
WALTER HYDE, Town Clerk.

Stockport, Jan. 15, 1891.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 172 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock, Oldham."

IRISH Bog Ore for Gas Purification. The very best imported. Sample Trucks sent from Depôt at Runcorn.

A. C. FRASER, Gas Engineer and Carbon Manufacturer, SALFORD.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 40.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.

Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MAN wanted at the Petworth Gas- Works, who understands the making and purification of Gas, the working of an Exhauster, and the general routine of a Gas-Works. One able to set retorts and do general Repairs at the Works preferred. House, with good Garden, Coal, and Gas found.

Apply, stating wages required, with full particulars of present and former employment, to the SECRETARY, Gas Company, PETWORTH.

WANTED, a set of four second-hand PURIFIERS, 6 or 8 feet square, with Valve and Connections for 6-inch Pipes.

Send price and full particulars to JOHN MACKENZIE, YARM-ON-TEES.

A New 24-inch Centre-Valve (dry-faced) to work One, Two, Three, or Four Purifiers; also strong wrought-iron CYLINDER, 6 ft. diameter by 30 ft. long, suitable for Scrubber, TO BE SOLD cheap.

Apply, by letter, to No. 1895, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ON SALE—Gas Coals and Nuts. Prompt Delivery.

Apply to the MADELEY COAL AND IRON COMPANY, LIMITED, Madeley, NORTH STAFFORDSHIRE.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.

Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

FOR SALE—60 tons of 4-inch Turned and Bored PIPES in 9-feet lengths (1 cwt. 1 qr. 20 lbs.), second-hand, but in good order. Will be sold at a low rate.

Apply to WM. MACLEOD AND CO., 56, Robertson Street, GLASGOW.

THE Sheffield United Gaslight Company invite TENDERS for the construction and fixing of a WROUGHT-IRON RECTANGULAR TUBE about 100 feet long by 6 ft. 8 in. wide and 10 in. deep.

Copy of drawing with full particulars may be obtained on payment of 10s 6d., and on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

Sealed Tenders, endorsed "Tender for Wrought-Iron Tube," to be sent in to me not later than Friday, Feb. 6, 1891.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 24, 1891.

THE Sheffield United Gaslight Company invite TENDERS for a WROUGHT-IRON ROOF, 57 ft. 6 in. long by 39 ft. 6 in. span, to be delivered and fixed at their Neepsend Station.

Copy of drawing and specification may be obtained on payment of 10s. 6d., and on application to the Company's Engineer, Mr. Fletcher W. Stevenson.

Sealed tenders, endorsed "Tender for Wrought-Iron Roof," to be sent in to me not later than Friday, Feb. 6, 1891.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager.

Commercial Street, Sheffield,
Jan. 24, 1891.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house

17, NEWTON STREET, PICCADILLY, MANCHESTER.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

TO RETORT MANUFACTURERS.

THE Directors of the Cirencester Gas Company, Limited, invite TENDERS for RETORTS.

Copies of the specification may be obtained from Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Sealed tenders, endorsed "Tender for Retorts, Contract No. 5," to be forwarded so as to reach me not later than Twelve noon on Tuesday, the 17th of February prox.

The lowest or any tender not necessarily accepted.

J. BEECHAM,
Secretary.

Gas Offices, Cirencester,
Jan. 24, 1891.

CORPORATION OF NELSON.

SULPHURIC ACID.

THE Gas Committee are prepared to receive TENDERS to supply 200 tons or SULPHURIC ACID.

Further information can be obtained from Mr. William Foster, Gas Manager.

Sealed tenders, endorsed "Tender for Sulphuric Acid," addressed to the undersigned, to be sent to my Office not later than the 29th inst.

By order,
R. M. PRESCOTT, Town Clerk.

Town Hall, Nelson,
Jan. 19, 1891.

TO GASHOLDER MANUFACTURERS.

THE Gas Committee of the Bingley Improvement Commissioners invite First-Class Firms to TENDER for the RE-SHEETING and the IMPROVEMENT IN ITS CONSTRUCTION, of their No. 1 TELESCOPIC GASHOLDER.

Specification and form of tender to be had on application to the undersigned.

The Commissioners do not bind themselves to accept any tender.

By order,
GEORGE DUNBAR MALAM,
Engineer.

Gas-Works, Bingley,
Jan. 14, 1891.

TO GASHOLDER MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a GASHOLDER.

The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Gasholder, Contract No. 2," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891,

TO GAS APPARATUS MAKERS.

THE Gas Committee of the Corporation of Congleton invite TENDERS for the construction and erection of a TOWER SCRUBBER.

The drawings and specification may be seen at the Gas Offices, Congleton, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Tower Scrubber, Contract No. 3," to be addressed to me, and sent so as to reach me not later than Twelve o'clock noon on Tuesday, the 10th of February next.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN WILSON,
Town Clerk.

Congleton, Jan. 17, 1891.

FIRE-CLAY RETORTS, ETC.

THE Buxton Local Board invite TENDERS for the supply of RETORTS, QUARRIES, BRICKS, CLAY, &c., for the coming season.

Tenders, endorsed, "Tender for Retorts, &c.," to be addressed to the Chairman of the Gas Committee, Town Hall, Buxton, not later than the 31st inst.

Forms of tender and other particulars may be obtained of Mr. G. Smedley, Gas Department, Town Hall, Buxton.

By order,
JOSIAH TAYLOR, Clerk.

Buxton, Jan. 8, 1891.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Swansea Gaslight Company are prepared to receive TENDERS for the removal and purchase of the TAR IN STOCK at their Works at Swansea; also the SURPLUS TAR produced at their Works for Twelve months from the 1st of February, 1891.

Sealed tenders to be sent in not later than Thursday, Feb. 5 next.

The Directors do not bind themselves to accept the highest or any tender.

By order,
THORNTON ANDREWS,
Secretary.

Swansea, January, 1891.

HARTLEPOOL GAS AND WATER COMPANY.

TO CONTRACTORS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a GASHOLDER TANK, 152 ft. 6 in. in diameter, and 30 ft. 6 in. deep, in Puddle Concrete, Brickwork, and Masonry, and the Erection and Completion of the same on their Land at West Hartlepool.

Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.

Tenders on form prescribed, and sealed and endorsed "Tender for Gasholder Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 11th day of February next.

The Directors do not bind themselves to accept the lowest or any tender.

By order of the Directors,
THOMAS TREWHITT,
Secretary.

Gas and Water Company's Offices,
West Hartlepool, Jan. 10, 1891.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that a Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office, on Friday, the 6th day of February next, at Twelve o'clock (noon) precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of office, in compliance with the Company's Acts or Schemes of Amalgamation.

Notice is hereby further given that, pursuant to the Standing Orders of both Houses of Parliament, an Extraordinary General Meeting of the said Proprietors will be held at the same Office immediately after the said Meeting, when a Bill to be introduced into Parliament, intituled "A Bill to confer Further Powers on The Gaslight and Coke Company, to remove Doubts, and for other Purposes," will be submitted to the Proprietors then present, either in person or by proxy, for their approval.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Jan. 21, 1891.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

SOOTHILL WOOD CANNEL.

Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

For Analysis and Price, apply to

The Soothill Wood Colliery Co., Ld.,
SOOTHILL WOOD COLLIERY,
BATLEY, YORKSHIRE.

Lanemark Coal Co.,
LIMITED.

LANEMARK CANNEL
AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

Price 6s., Cloth Bound, Bevelled Boards,

THE
GUIDE-FRAMING OF GASHOLDERS
AND OTHER PAPERS
CHIEFLY RELATING TO
STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.
BY
F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

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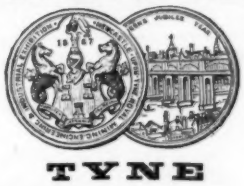

TYNE
BOGHEAD
CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP
GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St. Adelphi, LONDON, W.C.

Now Ready, 76 Pages, Demy 8vo., Bound in Limp Cloth, Lettered, Price 3s. 6d. post free.

THE VALUATION OF GAS-WORKS
FOR
ASSESSMENT,
By THOMAS NEWBIGGING, M. INST. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

EIGHTH YEAR. Now Ready (Demy 8vo., Price 5s. 6d. post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS
OF THE VARIOUS
DISTRICT ASSOCIATIONS OF GAS MANAGERS
For 1890,

Forming a Companion Volume to the Transactions of The Gas Institute, with which it is uniform in size.

*** THE VOLUMES for 1883 to 1889 ARE STILL ON SALE.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

TROTTER, HAINES, & CORBETT,
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FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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GLASGOW.
PUBLIC ANALYST,
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FEES MODERATE.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.

THE Owners of Holmside and South Moor Collieries possess an undivided area of nearly 5000 acres of COAL in the County of Durham, over the greater portion of which area the most of the best Coal of the district, including the well-known Hutton Seam, remains almost untouched; and as preparations are being made for working the Hutton Seam on a large scale, it is expected that the reputation of HOLMSIDE GAS COALS will be still further increased. The Holmside and South Moor Collieries have been in the hands of the same families for over half a century; but, until lately, no adequate attempt has been made to open out their very large Coal-Field, notwithstanding that the best Coal of the district around them, and especially the Hutton Seam, has been for some time past seriously diminished by reason of the vigorous workings of neighbouring coal-owners. Holmside Gas Coals are now being worked out of Holmside and South Moor Collieries at a rate of about 2200 tons per working day—a rate totally inadequate to meet the existing demand. By an extensive development of workings in the Hutton Seam, it is hoped that the demand may be fully met, and the quality raised to the highest point attainable by Durham Coal.

For price and particulars, apply to MARK ARCHER, Holmside and South Moor Offices, Quayside, NEWCASTLE-ON-TYNE.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

JAMES NEWTON & SONS,
(Established 1820)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
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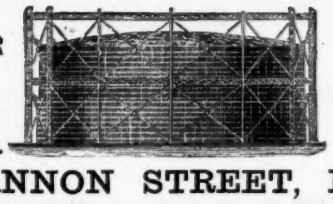

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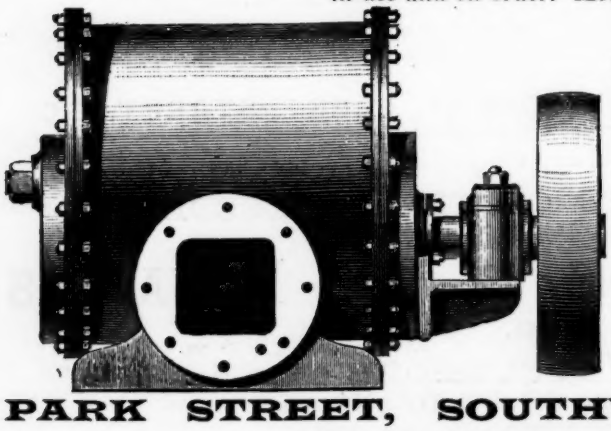

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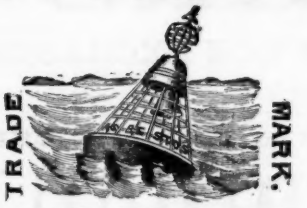
AQUOL  PAINT

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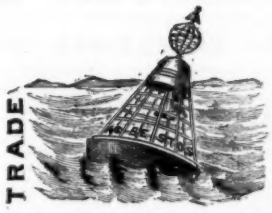

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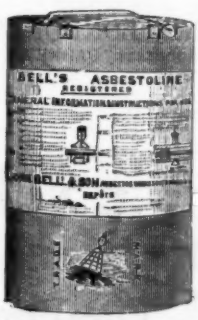

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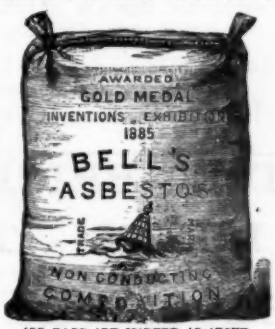

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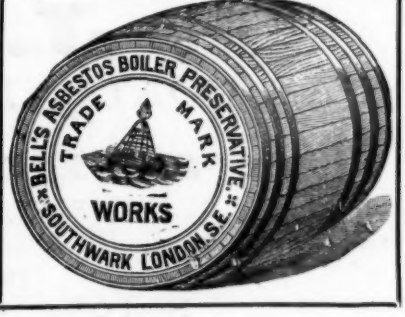

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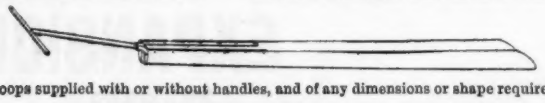

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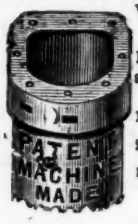

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GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

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Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT

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This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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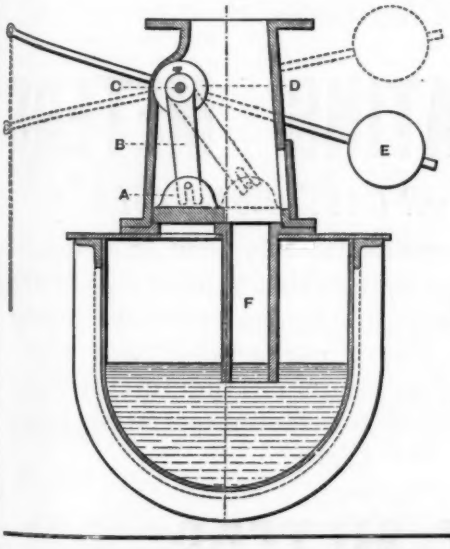

MEIKLEJOHN'S

PATENT

IMPROVED SLIDE-VALVE ANTI-DIP

Is perfectly reliable in action, and requires no attention.
Has all the advantages of the Dip and Anti-Dip combined.
Is cheap, and easily fixed to any form of main.
Will save more than their cost in one season's working.

MR. THOS. NEWBIGGING'S REPORT.

5, Norfolk Street, Manchester, Dec. 11, 1889.

SIR,—I have examined your Anti-Dip arrangement, and have seen it at work on the Retort-Benches at the Longwood Gas-Works, and the opinion which I have formed of its simplicity and certainty in working is distinctly favourable; so much so *that I consider it to be, without exception, the most efficient Appliance of the kind which has yet been introduced.* It can be applied to existing Benches with great ease, and at a minimum cost. So far as I am aware, it embodies a principle of action not previously applied in this direction.—Yours truly, THOS. NEWBIGGING.

Further particulars from the Sole Patentee and Manufacturer,

NEILL MEIKLEJOHN,

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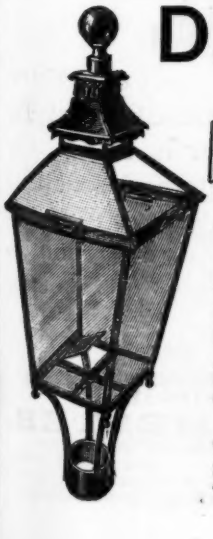

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No putty required.
Glass secured by hinged clips. No loose parts.
A new pane of glass can be fitted in a few minutes by any inexperienced person.
Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
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Several thousands of these are now in use, giving general satisfaction.
They are strongly made, and of best material.

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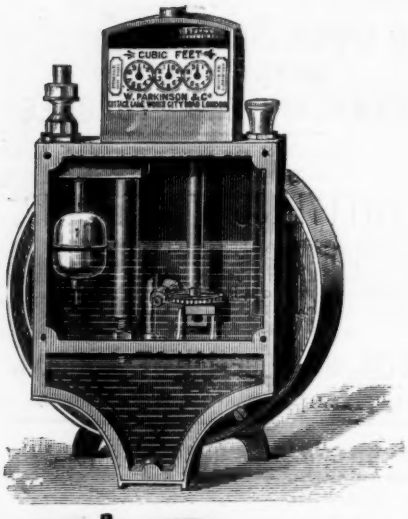

ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

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The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

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These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

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Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
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Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt., p. 146.

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